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ABSTRACT

The overall objective of this research was the development of procedures for selecting and training personnel to serve in Small Independent Action Forces (SIAF) units. This report of Phase III of the three-phase research and development project describes research that required two almost completely independent activities: (a) development of a composite training test, and (b) validation of selection tests and final development of selection materials and procedures into a Small Independent Action Forces Selection Program. Training procedures and materials for developing the required knowledges and skills were developed in Phases I and II. (Author)

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Selection and Training for Small Independent Action Forces: Final Report

Joseph A. Olmstead, James A. Caviness,
Theodore R. Powers, Jeffery L. Maxey, and Fred K. Cleary

HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street • Alexandria, Virginia 22314

February 1972

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The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development and consultation.

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FOREWORD

This is the final Technical Report for a project whose overall objective was the development of procedures for selecting and training personnel to serve in Small Independent Action Forces (SIAF). The project was conducted by the Human Resources Research Organization for the Advanced Research Projects Agency of the Department of Defense. The report summarizes activities of the entire project and describes in detail the work accomplished in the third and final operational phase.

The work on Phase III was begun in July 1971 and completed in December 1971. It was conducted by HumRRO Division No. 4, Fort Benning, Georgia. Dr. T.O. Jacobs, Director of Division No. 4, and Dr. Joseph A. Olmstead were Co-Principal Investigators. Mr. Theodore R. Powers supervised the development of training materials and the Composite Training Test. Other staff members concerned with training and training evaluation were LTC (Ret) Frank L. Brown, LTC (Ret) Clarence J. Bushaw, LTC (Ret) Fred K. Cleary, COL (Ret) Arthur J. DeLuca, LTC (Ret) Paul F. Ferguson, and LTC (Ret) George J. Magner. Dr. James A. Caviness supervised the development of selection procedures. Other staff members concerned with selection procedures were Mr. Jeffery L. Maxey and LTC (Ret) Bushaw.

The work was performed under ARPA Order 1257 and was monitored by the U.S. Army Missile Command under Contract No. DAAHO1-70-C-0488.

This report is dedicated to Frank L. Brown, LTC (Ret), deceased, United States Army 1936-1958, Human Resources Research Organization 1958-1971, whose 35 years of unselfish devotion to his country contributed significantly to both the technology and the content of the products of this project.

Meredith P. Crawford
President
Human Resources Research Organization

SUMMARY AND CONCLUSIONS

PROBLEM

Small Independent Action Forces (SIAF) are U.S. or Allied small combat elements designed to carry out operations independent of parent units in insurgency environments. When they are appropriately organized, equipped, and trained, Small Independent Action Forces possess capabilities to perform a variety of critical functions. However, such units operate under arduous and stressful conditions. Expert performance in demanding skill areas under extreme physical and psychological stress is a common requirement, and success of missions frequently depends on high levels of individual and team performance. Because human factors considerations play a major role in the performance of SIAF units, effective procedures for selecting and training personnel to serve in such units are of vital importance.

This report summarizes all activities performed by the HumRRO staff during a three-phase project whose objective was the development of materials and procedures for selecting and training personnel to serve in SIAF units, and describes in detail the work that was accomplished in the third phase of that project.

In Phase I of the project, SIAF operational requirements were analyzed, job-relevant activities of SIAF personnel were identified, and training programs were developed for six "Identified Critical Areas." In Phase II, training was developed for 19 additional SIAF activity areas, procedures for selecting SIAF personnel were developed, and a provisional evaluation was made of the selection tests. These two phases have been previously reported.[1]

During Phase III, a composite training test was developed for evaluating the effectiveness of SIAF training, and the previously developed selection tests were validated. In addition, screening procedures for selection purposes were developed. This report on Phase III activities constitutes the final report on the project.

APPROACH

The work in Phase III required two almost completely independent activities: (a) development of a composite training test and (b) validation of selection tests and final development of selection materials and procedures into a SIAF Selection Program.

For development of the composite training test, the approach was to develop the test scenario around specific criteria which were based upon previously identified Knowledges and Skills and Terminal Training Objectives. Evaluation factors were then developed for each criterion and, finally, administration and scoring procedures were developed.

The approach used for validation of the selection tests was to administer both criterion performance tests and the previously developed tentative SIAF Selection Test Battery to a sample of military personnel. The sample contained 70 Army Special Forces personnel and 70 randomly selected 82nd Airborne Division personnel at Fort Bragg N.C., thus providing both a wide distribution of skills and two discriminable, known groups of military personnel.

Linear Discriminant Function Analysis procedures were applied to criterion test scores in order to determine whether the tests were, in fact, representative of SIAF performance, (i.e., whether they discriminated between the two known groups). Stepwise multiple regression procedures were applied to data from the sample in order to determine the best combination of tests for predictive accuracy and to derive a prediction equation for use in selecting personnel. A set of procedures for screening applicants in medical, physical, and conduct aspects was also developed.

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[1] HumRRO Technical Reports 70-102 and 71-17.

RESULTS

The result of developmental efforts concerned with the composite training test was a document entitled *Composite Training Evaluation.* The document consists of six descriptive/instructive sections and three appendices. The sections are Introduction, Evaluation Design, Conduct of the Evaluation, Evaluation Control Plan, Scoring Standards and Procedures, and Orientation and Critique Plan. The appendices include references, evaluation supporting documents, and scoresheets to be used in the evaluation. The document was delivered to the sponsor on 1 September 1971.

From the Discriminant Function Analysis of the criterion tests administered to the Special Forces and the Non - Special Forces samples, it was found that the criterion tests satisfactorily discriminated between the groups and that 98.5% of the test subjects were accurately classified as to group membership. Since Special Forces performance was superior to that of Non - Special Forces personnel, it was concluded that the criterion tests are representative of SIAF performance.

When stepwise multiple regression procedures were applied to criterion test scores of a randomly selected sample of 100 of the subjects, the result was a multiple correlation coefficient of .73 (.63 when corrected for shrinkage) between criterion performance and a battery of 23 predictor tests. The Test Battery was cross-validated on a second sample of the remaining 40 subjects, and the result was a correlation coefficient of .41. A prediction equation was derived and it was found that, when "success" is defined as median or better performance on the criterion, the battery predicted success with 80% accuracy and predicted failure with 82% accuracy. It was concluded that the SIAF Selection Battery is a valid predictor of SIAF performance and may be used to select personnel for SIAF duty.

The product of the HumRRO effort concerned with selection is entitled "SIAF Selection Procedures." It contains (a) guidance for managing a SIAF selection program, (b) instructions for administration of the SIAF Selection Battery, and (c) copies of required materials, such as tests and answer forms.

CONCLUSIONS

(1) The methods of Systems Analysis and Systems Engineering of training and selection materials that were used in this project are valid and feasible approaches for the development of effective personnel systems.

(2) The training materials that were developed in this project provide the bases for efficient, economical, and highly effective training for performance in SIAF units. The materials will develop proficiencies required for all SIAF performance, except for certain

specialist training that must be obtained in formal Service schools and certain highly specialized environmental training.

(3) The SIAF Selection procedures which were developed provide an effective means for selecting personnel who possess a high probability of success in SIAF training and operations.

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Selection and Training for Small Independent Action Forces: Final Report

INTRODUCTION

This report summarizes all activities performed during a project whose objective was the development of materials and procedures for selecting and training personnel to serve in Small Independent Action Forces (SIAF) and describes in detail work that was accomplished in the third phase of that project.

In Phase I of the project, SIAF operational requirements were analyzed, job-relevant activities of SIAF personnel were identified, and training programs were developed for six "Identified Critical Areas." Phase I work was reported in HumRRO Technical Report 70-102, *Selection and Training for Small Independent Action Forces: System Analysis and Development of Early Training* (Olmstead and Powers, 1970).

In Phase II, training was developed for 19 additional SIAF activity areas, procedures for selecting SIAF personnel were developed, and a provisional evaluation was made of the selection tests. This work was described in HumRRO Technical Report 71-17, *Selection and Training for Small Independent Action Forces: Development of Materials and Procedures* (Olmstead, *et al.*, 1971).

During Phase III, a composite training test was developed for use in evaluating the effectiveness of SIAF training, and the previously developed selection tests were validated. Work accomplished in Phase III is described in detail in this final report.

MILITARY PROBLEM

Small Independent Action Forces are small U.S. or Allied elements whose purpose is the conduct of operations independent of their parent units in insurgency environments. Historically, combat activities in which small elements operated apart from other forces—usually as small reconnaissance or combat patrols—have played vital roles in successful military operations. The recent trend toward insurgent, guerrilla, paramilitary, and other types of unconventional warfare has placed an even higher premium on combat operations which, through the use of carefully selected, highly trained, and adequately supported small elements, can be conducted with minimum exposure of friendly personnel.

The potential of such elements for conducting operations of this type successfully has been greatly enhanced by advances in military technology, particularly in the areas of communications equipment; image-intensification devices and other types of sensors; helicopter and parachute transportation; indirect fire weapons and ammunition for mortars, artillery, and naval guns; armed helicopter support; and close tactical air support. Because of these technological advances, a single small independent action force can be provided a heretofore unattainable degree of mobility, enormously expanded capabilities for information gathering and target acquisition, and fire support exceeding that available even to a combat battalion in the relatively recent past.

When they are well trained, properly supported, and appropriately organized, SIAFs are capable of performing a variety of critical functions. However, SIAFs habitually operate under arduous and stressful conditions. Expert performance in demanding skill areas under extreme physical and psychological stress is the common requirement, with successful accomplishment of missions frequently depending upon high levels of individual and team performance. For these reasons, human factors considerations play a major role in the performance of SIAFs, and effective procedures for selecting and training personnel to serve in SIAF units are of vital importance.

RESEARCH PROBLEM

The effectiveness of Small Independent Action Forces may be influenced by a variety of both internal and external factors. Therefore, it is useful to conceptualize the SIAF as a system comprising a number of major interacting components, or subsystems. Conceptualization of the SIAF as a system makes it possible to identify and analyze all relevant components and influencing factors in order that each may be more effectively controlled. In this way, the critical components and factors may be identified and fixed, and may be manipulated for maximal effectiveness.

The principal components of the SIAF system are:

(1) Mission
(2) Organization
(3) Operational Tactics and Techniques
(4) Equipment
(5) Personnel

The purpose of the overall SIAF program is to determine the best ways of developing and integrating these components for maximum effectiveness of the total system. The project discussed in this report is a part of the overall program and was concerned with the Personnel component of the SIAF system—with the determination of performance requirements and with the development of selection and training procedures that will produce personnel who will meet these requirements.

Procedures for the selection and training of personnel for any system can be effective only when based upon the actual performance requirements of the system. In turn, actual performance requirements can be determined accurately only from thorough knowledge of the system within which performance is to be accomplished and of the contexts within which the system is to operate. It follows that the development of SIAF selection and training procedures must proceed from thorough knowledge both of the SIAF system and of the environments within which the system is expected to operate.

For this reason, the initial activities of this project included an analysis of the SIAF system and a determination of the relevant characteristics of pertinent components. These activities made possible the accurate determination of performance requirements and the development of appropriate selection and training procedures.

The project was accomplished within the scopes of four broad types of activities: (a) Systems Analysis, (b) Training Development, (c) Selection Development, and (d) Reporting. Figure 1 shows the work plan for the project, including the phases, and steps within phases, within which each type of activity was to be accomplished.

Plan of Work for Development of SIAF Personnel Selection and Training

Phase	Type of Activity			
	Systems Analysis	Training Development	Selection Development	Reporting
I	Analyze Missions Analyze Tasks	Develop Early Training in Identified Critical Areas		Technical Report
II	Specify Required Knowledges and Skills Develop Proficiency Measures	Develop Training Objectives Develop Training Program Descriptions	Develop Criterion Measures Identify Predictor Variables and Develop Prediction Tests Test Predictor Variables Develop Selection Test Battery	Technical Report
III		Develop Composite Training Test	Validate Selection Test Battery	
IV				Final Technical Report

Figure 1

PHASES I AND II

PHASE I

Activities in Phase I included (a) the use of government-supplied data for analysis of the SIAF system according to types of predicted missions, (b) the use of resulting mission profiles to analyze the various required activities and to develop inventories of tasks to be performed in SIAF units, and (c) the early development of training for certain critical activities for which previous studies had indicated training was inadequate.

Analysis of Missions

Two sources of information were used to identify the various missions performed by SIAF units: (a) documents that reported, described, or discussed activities of small units that operate independently, and (b) detailed interviews of representatives of U.S. or Allied services, agencies, or units that have used small independent teams in recent combat operations.

Analyses of data from these sources yielded profiles of five different types of missions typical of most SIAF operations. The missions differed mainly according to (a) purpose, (b) distance traveled, (c) ratio of combat to reconnaissance operations, and (d) use of indigenous personnel. The profiles are detailed outlines of the characteristics of the various missions and descriptions of the activities of personnel in terms of operational requirements. Descriptions of the profiles appear in HumRRO Technical Report 70-102 (Olmstead and Powers, 1970).

Task Analysis

The profiles resulting from the analysis of missions were designed to identify functions performed by SIAF personnel while executing the missions. When identified, the functions were classified according to "activity areas"—groups of related activities—which were then studied to determine those activities common to all missions and those unique to certain ones.

Finally, the analysis yielded a set of Task Inventories—detailed and comprehensive listings of all job-relevant activities of SIAF personnel. A total of 27 Task Inventories were developed and classified according to subject area. They provided the bases for subsequent development of training materials.

Early Training in Identified Critical Areas

HumRRO had earlier collected data based on post-action interviews with Army personnel in Vietnam, including personnel engaged in long-range patrolling. The data indicated that in certain activities current training was inadequate for developing the performance capabilities required in operations characteristic of SIAF units. These were activity areas in which improved training was obviously needed and could be implemented as soon as Program Descriptions were available.

Accordingly, the sponsor requested that training in these "Identified Critical Areas" be developed and be made available at the completion of Phase I. The areas in which training was developed were Land Navigation; Delivery of Indirect and Aerial Supporting Fires; Use of Camouflage, Cover, Concealment, and Stealth; Human Maintenance; Tracking; and Communications. Program Descriptions covering the above areas were delivered to the sponsor at the completion of Phase I.

PHASE II

Activities in Phase II included (a) completion of analysis of the SIAF system, (b) development of training procedures for remaining activity areas, and (c) development of selection procedures.

Completion of Systems Analysis

The Task Inventories that were developed in Phase I served as sources for specification of critical knowledges and skills required for effective performance of SIAF duties. The specification of the required knowledges and skills completed the analysis of the SIAF system.

Development of Training Procedures

The list of identified critical knowledges and skills was the basis for development of training procedures and materials. Accomplishment of this step required:

(1) Grouping of knowledges and skills according to content or activity area.
(2) Developing terminal training objectives for each area.
(3) Developing a Program Description for each activity (content area). Each Program Description included terminal training objectives, listings of the knowledges and skills to be developed, recommended subject schedules (including topics to be presented, time allocations, and references), and recommended methods of instruction.

In Phase II, 19 Program Descriptions were developed. When these were added to the six Program Descriptions which were developed in Phase I, the result was a total of 25 Program Descriptions which comprise the full SIAF training program developed by HumRRO. Table 1 lists the titles of the Program Descriptions that comprise the SIAF training program and shows the numbers of knowledges and skills and terminal training objectives for each content area. An additional product of Phase II was *Guide for the Use of SIAF Program Descriptions*, a volume to accompany the Program Descriptions and provide information and guidance for their use.

Discussion of the content of each Program Description, recommended sequences of training, and suggestions concerning the development of training appear in both the above administrative volume and HumRRO Technical Report 71-17 (Olmstead *et al.*, 1971). Materials comprising the SIAF training program were delivered to the sponsor upon completion of Phase II.

Development of Selection Procedures

During Phase II, the Development of Selection Procedures included the following activities:

(1) Analysis of current practices used to select entering personnel by organizations that perform missions similar to those anticipated for SIAF units.
(2) Development of criterion proficiency measures to be used in Phase III for validation of the developed Selection Test Battery.
(3) Identification of predictor variables and development of Prediction Tests.
(4) Conduct of a provisional evaluation of Prediction Tests involving determination of their ability to discriminate between two known groups, one consisting of members of "SIAF-like" organizations and one of personnel in a typical TO&E Army unit.
(5) Integration of the most effective Prediction Tests into a tentative SIAF Selection Battery.

Table 1

Summary of Knowledges and Skills and Terminal Training Objectives by Content Area

Program Description Number	Content Area	Knowledges and Skills	Terminal Training Objectives
1	Land Navigation	42	7
2	Delivery of Indirect and Aerial Fire Support	248	8
3	Use of Camouflage, Cover, Concealment, and Stealth	52	8
4	Human Maintenance	314	17
5	Fundamentals of Tracking	47	5
6	Communications	98	4
7	Use of Aerial Photographs	18	7
8	Physical Conditioning and Combatives	38	3
9	Use of Individual Weapons	142	15
10	Use of Machineguns	51	11
11	Demolitions	42	9
12	Use of Hand Grenades	71	20
13	Use and Detection of Mines, Boobytraps, and Warning Devices	184	26
14	Combat First Aid	116	7
15	Use of Image Intensification Devices	61	6
16	Leadership	57	12
17	Intelligence	107	8
18	Mission, Organization, and Employment of a SIAF	54	6
19	Airmobile Procedures	107	9
20	Use of Small Boats and Stream-Crossing Expedients	13	3
21	Mountaineering	13	5
22	Use of Sensors	91	7
23	Patrolling	58	8
24	Survival, Evasion, and Escape	61	5
25	Civic Action, Language Development, and Training of Indigenous Forces	87	4
	Total	2,172	220

Survey of Current Practices. During the Phase I Survey of Current Practices, information concerning missions, training methods, and selection practices had been collected from various U.S. services and agencies, as well as from British and Australian forces. In Phase II, current practices of these organizations were analyzed from the particular standpoint of determining personal and physical characteristics that would be relevant for SIAF selection purposes.

Development of Criterion Proficiency Measures. The task analyses performed in Phase I were the bases for development of criteria proficiency measures. The 335 descriptions of on-the-job performance that made up the Task Inventories were examined for candidate criteria. The search was for performance items which (a) could be quantified and measured, (b) possessed recognized implicit or explicit standards, and (c) were judged to show promise as criteria—to have a special relationship to job success.

Candidate criteria were selected with relation to "general" SIAF performance; that is, performance items that were common to all SIAF members were selected. All items that were chosen were judged to be required by all SIAF personnel, and no performances requiring specialized skills were included.

From the list of candidate criteria, a final set to serve as bases for criterion tests was selected by four military experts (retired field-grade officers). Each expert independently selected from the list of candidate criteria the 25 tasks he judged to be most critical for successful SIAF performance. Ratings were then pooled and the 25 tasks receiving the greatest consensus among the experts were identified to serve as criteria. For most performances, the experts were unanimous in their selections.

Thus, although the ultimate task of any SIAF is successful completion of its mission, penultimate criteria were developed for the present project, and a measure of performance was developed for each criterion. The criterion measures are further discussed in the Method section and are described in Appendix A of this report.

Identification and Development of Prediction Tests. Predictor variables are those human characteristics that are related to criterion performance. Prediction tests are measures of predictor variables, whose scores correlate well with criterion measures. Accordingly, the task was to identify or develop tests that will measure predictor variables and will predict performance on criterion tests.

Data from the survey of current practices and from the task analysis were studied to identify characteristics that appeared to have relevance for SIAF performance. After identification of potential predictor variables, a large number of tests and measuring devices were surveyed to select tests or test items that appeared to measure characteristics similar to those comprising the predictor variables. Attempts were made to select tests upon which substantiating data were available and in most instances this was possible.

The resulting tests included devices that measure experience, attitudes, interests, interpersonal relations, and practical judgment. Also included were a set of cognitive tests, a questionnaire for collecting biographical information, and a Personal Information Form for recording entries from personnel records, with special emphasis upon already operational tests such as the Army Classification Battery. The tests were described in detail in HumRRO Technical Report 71-17 (Olmstead *et al.*, 1971) and are discussed further in later sections of this report.

Provisional Evaluation of Prediction Tests. A provisional test of the tentative predictor battery was performed. The objective was to determine ability of the candidate tests to discriminate between two known groups, one (Special Forces) consisting of 71 soldiers who were assumed to be proficient in performances required of SIAF members and one consisting of 76 randomly selected soldiers. If the tests successfully discriminated between the groups, they could be assumed to possess some provisional validity; whereas if the tests did not discriminate, they would require modification or discarding.

The tests were administered to a group of U.S. Army Special Forces personnel and a group of randomly selected soldiers of the U.S. Army Combat Developments Command Experimentation Center at Hunter Liggett Military Reservation, California. These two samples constituted groups of known training and performance ability.

The full results of the provisional validation session were reported in HumRRO Technical Report 71-17. In summary, it was found that the tests satisfactorily discriminated between the two groups and that 90.5% of the test subjects were accurately classified as to group membership by the set of selection tests. Therefore, it was concluded that the tests appear to possess the capability to discriminate between individuals who possess "SIAF-like" characteristics and those who do not. The tests were then integrated into a tentative SIAF Selection Battery, to be finally validated in Phase III.

PHASE III METHOD

Work to be accomplished in Phase III involved (a) the development of a Composite Training Test which could be used to evaluate the SIAF training program and (b) final development of SIAF Selection Procedures, which included development of screening procedures and validation of the selection test battery.

DEVELOPMENT OF A COMPOSITE TRAINING TEST

In development of the Composite Training Test, the approach was to (a) select the best format for the test, (b) develop the test in the selected format, (c) develop procedures for administering the test, and (d) develop procedures for observing test performance and recording results.

As a framework for accomplishing the above activities, the following assumptions were made: (a) All test participants will have successfully completed the SIAF training program or will possess equivalent training or experience, (b) six-man SIAF teams will be the basic operational units of the test participants, and (c) the several parts of the test will be conducted in prearranged sequence (described below).

Selection of the Test Format

The initial step in selecting the test format was to analyze and compare three types of commonly used tests for efficacy and difficulty of administration. The three types of tests which are commonly used by the Services are knowledge tests (written and oral), performance tests, and combined knowledge-performance tests. From a comparative analysis, it was concluded that, although somewhat more difficult to conduct, a performance test clearly would result in the most valid evaluation of the effectiveness of the SIAF training program.

Attention was then directed to determination of the specific type of performance test to be used, and two major types—"county fair" and field training exercise—were analyzed and compared. It was concluded that, although more difficult to conduct, only a field training exercise would allow inclusion of certain features deemed essential to a valid evaluation of the effectiveness of the SIAF training program.

These essential features were (a) concurrent but selective evaluation of both the individual and the team training contained in the SIAF training program; (b) creation of operational situations in which test participants would be subjected to, and required to perform under, conditions of extreme physical and psychological stress realistically simulating those commonly encountered in actual SIAF operations; (c) flexibility of conduct sufficient to allow test administrators to adapt procedures to local terrain and facilities without adversely affecting the overall validity of the test; and (d) flexibility sufficient to permit each using Service to develop criteria for judging overall SIAF performance which would accurately reflect that Service's specific training standards and specific training philosophy.

Development of the Test

Initially, the test was conceptualized as a single field exercise. However, analysis of all elements required to be included indicated that such an exercise would be administratively unwieldy and would necessitate conduct within tactically unrealistic and obviously contrived operational situations. Through further analysis, it was determined that conduct of the test in phases—that is, as several separate field exercises—with each phase conducted within a mode in which SIAFs commonly are deployed, would be feasible in all respects and would permit realistic incorporation of all essential elements.

Accordingly, the test was finally conceptualized, and subsequently developed, in three phases:

Phase I—Operations of SIAFs as short-range patrols.
Phase II—Operations of SIAFs as long-range patrols.
Phase III—Operations of SIAFs as the U.S. elements of combined action tactical units, with principal orientation to civic action.

Incorporation of Subject Matter. The initial step in developing the three phases of the test was determination of the subject matter to be evaluated in each phase. This was accomplished by analyzing all SIAF Program Descriptions (a) to ascertain the phase or phases in which the subject matter of each Program Description, as reflected in Terminal Training Objectives, could best be evaluated; and (b) to determine where desirable overlap of subject matter between two or more phases could be effected. It was concluded that, because of the special terrain requirements, it would not be feasible to attempt, in this test, evaluation of the subject matter of "Program Description No. 21 - Mountaineering." However, evaluation of the subject matter of all other Program Descriptions was found to be feasible. The results of the analysis are shown in Table 2.

Development of Phase Outlines. An intermediate step was development of an outline of each of the phases comprising the composite test. This step entailed, first, development of a logical overall tactical situation within which the activities of each phase would occur. Second, for each phase, an initial situation was developed which logically permitted or required the deployment of SIAFs in the mode of that particular phase. Each of the three initial situations was specifically designed to be compatible with the overall tactical situation and to be suitable to subsequent situations to be developed.

Division of Test Phases. A second intermediate step was the division of each test phase into parts, each of which encompassed a discrete activity area of the phase. Phases I and II were identically divided into Part1—Planning and Preparation; Part 2—Insertion; Part 3—Deployment; and Part 4—Debriefing and Critique. Phase III was divided into Part 1—Planning and Preparation; Part 2—Entrance Into Village; Part 3—Securing Village; Part 4—Training Indigenous Personnel; Part 5—Defense of Village; and Part 6—Civic Action.

Division of test phases into parts served several purposes. First, parts were convenient frameworks within which to develop the details of the various situations in each phase. Second, division into parts permitted cross-checking for appropriate inclusion within each phase of Terminal Training Objectives and Knowledges and Skills. Finally, each part was an appropriate framework within which to develop test scoring procedures.

Detailed Development of Phase Scenarios. The final step in developing the composite test was to expand the general outline of each phase into a scenario of activities that were to occur. This involved developing, for each phase, a continuing series of situations, each of which was designed (a) to possess demand characteristics which would logically elicit performance stipulated by the one or more Terminal Training Objectives to be evaluated in that particular situation, and (b) to appear to be a logical development from the preceding situation. Contents of the scenarios are described in the Results section of this report.

Within each part of a phase, the scenario was designed to address certain training content areas directly, that is, to evaluate achievement of Terminal Training Objectives in certain specific content areas. In addition, some parts address certain content areas indirectly; that is, performance in these content areas may be required but is subordinate to the areas addressed directly. Finally, performance in some content areas

Table 2

Test Phases in Which Each Content Area is Evaluated[a]

	Content Area	Test Phase I	Test Phase II	Test Phase III
1	Land Navigation	E	E	E
2	Delivery of Indirect and Aerial Fire Support	E	E	E
3	Use of Camouflage, Cover, Concealment, and Stealth	E	E	E
4	Human Maintenance	E	E	E
5	Fundamentals of Tracking	E	E	E
6	Communications	E	E	E
7	Use of Aerial Photographs	E	E	E
8	Physical Conditioning and Combatives	E	E	E
9	Use of Individual Weapons	E	E	E
10	Use of Machineguns	NE	E	E
11	Basic Demolitions	NE	E	E
12	Use of Hand Grenades	E	E	E
13	Use and Detection of Mines, Boobytraps, and Warning Devices	E	E	E
14	Combat First Aid	E	E	E
15	Use of Image Intensification Devices	E	E	E
16	Leadership	E	E	E
17	Intelligence	E	E	E
18	Mission, Organization, and Employment of a SIAF	E	E	E
19	Airmobile Procedures	E	E	E
20	Use of Small Boats and Stream-Crossing Expedients	NE	E	NE
21	Mountaineering	NE	NE	NE
22	Use of Sensors	E	NE	E
23	Patrolling	E	E	E
24	Survival, Evasion, and Escape	E	E	NE
25	Civic Action, Language Development, and Training of Indigenous Forces	NE	NE	E

[a] E, Evaluated; NE, Not Evaluated.

is not a requirement in some parts. Table 3 indicates the manner in which content areas were addressed in each part.

Development of Administration Procedures

Of necessity, the development of administration procedures could begin only after the content of the test had been developed sufficiently to provide a comprehensive overview. Administration procedures for the test were then developed by (a) analyzing the scenarios to determine terrain requirements for the various test situations;

Table 3

Design of Composite Training Test[a]

	Content Area	Phase I Short-Range Patrol				Phase II Long-Range Patrol				Phase III Combined Action Tactical Elements					
		Part 1	Part 2	Part 3	Part 4	Part 1	Part 2	Part 3	Part 4	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6
1	Land Navigation	X	X	X	X	X	X	X	X	N	X	X	X	X	N
2	Delivery of Indirect and Aerial Fire Support	X	X	X	X	X	N	X	X	N	N	X	O	X	X
3	Use of Camouflage, Cover, Concealment, and Stealth	X	X	X	X	X	X	X	X	N	N	X	N	X	N
4	Human Maintenance	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	Fundamentals of Tracking	N	X	X	X	N	N	X	N	N	N	O	O	X	N
6	Communications	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	Use of Aerial Photographs	X	N	O	N	X	X	X	X	X	X	N	N	N	N
8	Physical Conditioning and Combatives	O	X	X	X	O	X	X	X	X	X	X	N	X	X
9	Use of Individual Weapons	X	X	X	O	X	X	X	X	N	N	X	N	X	N
10	Use of Machineguns	N	N	N	N	N	N	X	X	N	N	N	N	X	N
11	Basic Demolitions	N	N	N	N	N	N	X	N	N	N	O	N	O	N
12	Use of Hand Grenades	O	O	X	O	N	N	X	N	N	N	N	N	O	N
13	Use and Detection of Mines, Boobytraps, and Warning Devices	N	N	X	X	O	O	O	O	N	N	X	X	X	N
14	Combat First Aid	O	O	X	O	O	O	X	O	N	N	N	N	X	N
15	Use of Image Intensification Devices	X	X	X	O	O	O	O	N	N	N	X	N	X	N
16	Leadership	X	X	X	X	X	X	X	X	X	X	X	X	X	X
17	Intelligence	X	X	X	X	X	X	X	X	X	X	X	N	X	N
18	Mission, Organization, and Employment of a SIAF	X	X	X	X	X	X	X	X	X	N	N	N	N	O
19	Airmobile Procedures	X	N	X	X	X	X	X	X	X	N	N	N	N	N

Continued

Table 3 *(Continued)*

Design of Composite Training Test[a]

	Content Area	Phase I Short-Range Patrol				Phase II Long-Range Patrol				Phase III Combined Action Tactical Elements					
		Part 1	Part 2	Part 3	Part 4	Part 1	Part 2	Part 3	Part 4	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6
20	Use of Small Boats and Stream-Crossing Expedients	N	N	N	N	O	N	X	N	N	N	N	N	N	N
21	Mountaineering	N	N	N	N	N	N	N	N	N	N	N	N	N	N
22	Use of Sensors	O	O	X	O	N	N	N	N	N	N	X	N	X	N
23	Patrolling	X	X	X	X	X	X	X	X	N	N	X	X	X	N
24	Survival, Evasion, and Escape	O	N	N	N	O	N	X	N	N	N	N	N	N	N
25	Civic Action, Language Development, and Training of Indigenous Forces	N	N	N	N	N	N	N	N	X	X	X	X	X	X

[a] X = Addressed Directly; O = Addressed Indirectly; N = Not Addressed.

(b) determining requirements for support other than personnel; (c) determining requirements for administrative personnel and establishing their duties and responsibilities; and (d) developing detailed instructions for all personnel.

Development of Scoring Procedures

Development of scoring procedures involved (a) design of scoresheets/checklists on which to record evaluations of the performance of test participants and (b) composition of instructions for use of these scoresheets/checklists. Because scoring procedures were developed within the framework of the parts into which each phase of the test was divided, scoresheets/checklists were similarly divided into sections for the respective phases and parts of phases.

Scoresheets/Checklists. To develop scoresheets/checklists, the scenario for each phase of the test was analyzed to identify relevant Terminal Training Objectives and the tasks required for adequate accomplishment in the test situation. The result was a list of tasks for each situation. For each task, one or more checklist items were derived. A requirement for each item was that it must be pertinent to a task and that the behavior to which it refers must be both observable and capable of evaluation as to how well it was performed. Within each phase, scoresheets/checklists were designed so that the items, taken together, provided for evaluation of performance of all Terminal Training Objectives pertinent to the phase.

The scoresheets/checklists included provision for the assignment of one of three adjectival ratings—Superior, Satisfactory, and Unsatisfactory—to test participants' performance on items. The standard for comparison in evaluating is "average" performance, as defined in or by the using Service's training standards and training philosophy. In addition, provision was made for a rating of "not observed" or "not evaluated" to be used when nonaccomplishment of an item or nonobservation of accomplishment is a function of the testing environment; assignment of such a rating neither credits nor penalizes test participants.

Instructions for Evaluation and Recording. Finally, comprehensive instructions were written to prescribe evaluation and recording procedures. The instructions describe the process evaluators are to employ when rating each task and the manner in which ratings are to be recorded.

DEVELOPMENT OF SELECTION PROCEDURES

The concept for SIAF personnel selection includes (a) preliminary screening of applicants according to a set of pre-established standards and (b) administration of selection tests to applicants who have successfully passed the preliminary screening. Successful completion of both steps would be required for acceptance into the SIAF program.

Work in Phase III involved derivation of screening standards and final validation of the test battery which was developed in Phase II.

Screening Procedures

Early in the project, it was recognized that effective SIAF performance requires certain attributes in addition to those which would be measured by the tests in the Selection Battery. Examples are health, physical condition, age, and moral character. It was further concluded that standards in relation to these attributes would serve as effective devices for initial screening of SIAF applicants because, in each instance, some minimal level of capability is required for adequate performance. For example, an individual who has certain critical physical defects or who is below standard in stamina would not be able to perform satisfactorily regardless of his psychometric suitability as measured by the tests. Accordingly, it was decided to develop a set of minimal entry standards that would initially screen potential SIAF personnel, prior to final determination of suitability through use of the test battery. It was also concluded that such standards must be based upon practical experience in SIAF operations.

Results of the previously described survey of current practices were analyzed to identify those attributes and standards deemed essential by U.S. and Allied services with experience in operations like those anticipated for SIAF units. The following U.S., Australian, and British programs were analyzed: U.S. Army Airborne Course, U.S. Army Special Forces, U.S. Navy UDT/SEALs, U.S. Army Ranger Course, U.S. Marine Force Reconnaissance Company, U.S. Army Recondo Training, Special Air Service Regiment (Australia), and 16th Paratroop Brigade (British).

Entry requirements and elimination standards of each program were analyzed and commonalities among the programs were identified. The results of the analysis were reported in HumRRO Technical Report 71-17 (Olmstead *et al.*, 1971). In Phase III, these data served as the bases for derivation of a set of standards from which were developed procedures for initial screening of SIAF applicants.

Final Validation of Selection Battery

The ultimate goal of the test development efforts was validation of the tentative battery which was developed and provisionally evaluated in Phase II. Validation involves a test, or demonstration, of the predictive efficacy of the battery by determining the relationship between scores on the tests and scores on criteria which reflect SIAF performance. In short, validation is determination of the accuracy with which the tests predict SIAF performance.

In the present study, validation was accomplished by administering the criterion measures, developed in Phase II, to a number of military personnel judged to possess a wide range of abilities, administering the prediction test battery to the same individuals, and analyzing scores from both types of tests to determine the predictive relationship between them.

Criterion Proficiency Measures. The Criterion Proficiency Measures included (a) a SIAF Performance Test comprised of 18 test situations that sample proficiency in 16 different areas of SIAF performance, (b) a SIAF Knowledges and Skills Test, (c) a SIAF Confidence Inventory, and (d) Self and Peer Performance Ratings. The development of these tests was discussed in HumRRO Technical Report 71-17 and they are described in Appendix A of this report.

The SIAF Performance Test was administered at two test sites, within the same military installation. One site was a central complex based upon the "county fair" system with various testing stations and the second consisted of several field stations (e.g., firing ranges). At all sites, performance was assessed by trained raters who assigned numerical point values to testees' performance.

Criterion measures other than the SIAF Performance Test required completion of forms or questionnaires and were administered at a central location. The SIAF Knowledges and Skills Test and the SIAF Confidence Inventory were administered during the same time period as the Selection Battery. Self and Peer Performance Ratings were obtained after all performance tests were completed.[1]

Prediction Tests. Development of the prediction tests which comprised the tentative SIAF Selection Battery was described in HumRRO Technical Report 71-17. The following tests were administered in the final validation procedure:

(1) Interest Opinion Questionnaire (IOQ)—Form A. Form A is a 150-item inventory that samples the following categories: (a) the respondent's general interests, 52 items; (b) his personal history, 16 items; (c) his "feelings" relative to certain events and situations, 70 items; (d) his "sense of humor," 5 items; and (e) his "self-concept," 7 items. The items included in Form A of the IOQ were taken from a larger number of items which have been shown to differentiate between "fighters" and "non-fighters" among U.S. Army combat soldiers (Egbert *et al.*, 1958).

(2) Life History Inventory (LHI)—Form L. Form L of the LHI is an inventory composed of 55 items which sample the following categories: (a) the respondent's socioeconomic level, 9 items; (b) the respondent's home environment, 6 items; (c) the respondent's religious background, 1 item; (d) the respondent's health and vitality, 8 items; (e) the respondent's social and educational history, 17 items; (f) the respondent's army experience, 3 items; (g) the respondent's history of participation in different activities, hobbies, and recreations, 9 items; and (h) the respondent's childhood social behavior, 2 items. This inventory was selected because it has been found to differentiate between known groups of "fighters" and "non-fighters" (Egbert *et al.*, 1957).

(3) Military Interest Blank (MIB)—Form HK-3. Form HK-3 of the MIB inventory is composed of 400 items which sample the following interest categories: (a) enlisted military occupational specialties, 135 items; (b) officer military occupational specialties, 140 items; (c) specific military situations about which a soldier may have either a positive or a negative attitude, 40 items; (d) specific personal characteristics, mannerisms, and practices of other individuals that a soldier would prefer in a roommate, 35 items; and (e) civilian occupations, 50 items. The MIB was developed during HumRRO Work Unit OCS in which it was found that the MIB is a useful predictor of success or failure in military programs (Holmen *et al.*, 1954).

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[1] These ratings were not used because many subjects completed forms improperly.

(4) SIAF Activities Inventory (AI)—Form PH. Form PH of the AI is an inventory which measures two opposing attitudinal factors—a "confidence" attitude and a "despair" attitude—which operate only in situations where there exists the possibility of physical harm. Each of the attitudes is conceived as having two components—a background component and a specific or situational component. The strength of the background component is based on all past experiences in threatening situations; it remains essentially the same from situation to situation and is resistant to change after the individual is in his teens or early twenties. The situational component varies in strength as a function of the particular situation, depending on the individual's past experience in similar situations. Form PH of the AI measures both background confidence and background despair and provides a numerical index of each, as well as an index of resistance to stress (Kern, 1966).

(5) Team-Task Motivation Questionnaire (TTM). The TTM is a 24-item inventory that requires the respondent to make either a group (team)- or an individual (nonteam)-oriented response to each item. A high score on this questionnaire reflects a team-oriented disposition while a low score reflects a nonteam or self-oriented disposition. The items were selected from an item pool developed during HumRRO Work Unit UNIFECT at HumRRO Division No. 4.

(6) Cognitive Test Battery (CTB). The Cognitive Test Battery is composed of seven cognitively oriented tests of ability. The tests are: (a) Auditory Number Span Test, (b) Embedded Figures Test (Short Form), (c) Number Comparison Test, (d) Similarities Test, (e) Verbal Classification Test, (f) Word Grouping Test, and (g) Word Number Test. The tests were developed at HumRRO Division No. 4 by James W. Dees within a conceptual framework proposed by Guilford (1968, pp. 6-28).

(7) SIAF Personal Information Form (SIF). The SIAF Personal Information Form is a data collection sheet with entry slots for descriptive items and test scores. Of central interest are scores from the Army Classification Battery (ACB). Scores included from the ACB are Verbal, Arithmetic Reasoning, Mechanical Aptitude, Pattern Analysis, Army Clerical Speed, Automotive Information, Shop Mechanics, and Electronics Information.

Table 4 lists the tests in the Prediction Battery and shows the scores derived from them.

Subjects. For the final validation, it was planned to administer all tests to 100 Special Forces (SF) personnel and 100 Army personnel who were not Special Forces (NSF). This procedure was used to ensure a wide range of SIAF abilities among the subject group and, in addition, it permitted a replication of the discriminability study of the selection battery that was performed in Phase II.

Special Forces personnel were members of the John F. Kennedy Special Warfare Center, Fort Bragg, North Carolina and NSF personnel were members of the 82nd Airborne Division.

Test Administration. Both prediction and criterion tests were administered at Fort Bragg. Personnel who assisted in conduct of the tests and performance evaluators were provided by 82nd Airborne Division. Table 5 shows the schedule for administration of the tests. Total time required was six days.

Analysis

Cross-Validation of Predictor Discriminant Analysis. During Phase II, prediction test scores were analyzed by use of Discriminant Analysis to determine whether the test battery could discriminate between SF and NSF personnel. The results showed that the tentative Selection Battery did discriminate significantly between SF and NSF personnel.

Table 4

Scores Derived From Prediction Test Battery

Test and Score	Number of Scores
Interest Opinion Questionnaire	1
Interest Opinion Questionnaire Fighter Score	
Life History Inventory	1
Life History Inventory Fighter Score	
Military Interest Blank	1
Military Interest Blank Fighter Score	
Activities Inventory	3
Activities Inventory Background Confidence Score	
Activities Inventory Background Despair Score	
Ratio of A1 Background Confidence to A1 Background Despair Score	
Team Task Motivation Questionnaire	1
Team Task Motivation Questionnaire Score	
Cognitive Test Battery	7
Auditory Number Span Test Score	
Embedded Figures Test Score	
Number Comparison Test Score	
Similarities Test Score	
Verbal Classification Test Score	
Word Grouping Test Score	
Word-Number Test Score	
SIAF Personal Information Form	8
ACB Verbal Score	
ACB Arithmetic Reasoning Score	
ACB Mechanical Aptitude Score	
ACB Pattern Analysis Score	
ACB Army Clerical Speed Score	
ACB Automotive Information Score	
ACB Mechanical Aptitude Score	
ACB Electronics Information Score	

In order to verify the discriminability of the Selection Battery, Linear Discriminate Function coefficients obtained in Phase II were applied to prediction test scores of SF and NSF personnel tested in Phase III so as to obtain Linear Discriminant scores on the new samples. A test for significance of the difference between the means for SF and NSF was computed. If a significant difference were found between the groups, it could be concluded that the discriminatory power of the test battery is stable.

Discriminant Analysis of Criterion Measures. An important question is whether the criterion measures discriminate between SF and NSF personnel. If Special Forces personnel are assumed to possess skills and training similar to those found to be necessary for SIAF performance and if SF personnel perform significantly better than NSF personnel

Table 5

Schedule for Test Administration

Day	Event
1	Paper-and-pencil testing for all personnel.
2	SF personnel completed five-mile march and six range tests.
	NSF personnel completed county fair tests.
3	All personnel completed 15-meter swim test.
4	SF personnel completed county fair test.
	NSF personnel completed five-mile march and six range tests.
5	All personnel completed Land Navigation test.
6	All personnel who did not complete the paper-and-pencil testing of Day 1 completed those tests which were unfinished as of Day 6.

on the criterion tests, this would provide some confirmation that the criteria, in fact, measure SIAF performance. In order to determine whether the set of 20 criterion tests discriminated between SF and NSF personnel, raw scores on the tests were converted to standardized scores which were then subjected to Discriminant Analysis.

For each criterion test, raw scores for both groups of personnel were pooled to provide one distribution. Raw scores were then converted by a linear transformation into standardized scores (Z) to produce distributions of mean equal to 50 and standard deviation equal to 10. Then, Hotelling T^2 statistic was computed to determine whether a difference existed between the two groups of subjects on the basis of the 20 criterion scores considered simultaneously; after criterion scores for the two groups were found to be different, a linear discriminant function was derived and used to compute linear discriminant scores for each individual in each group.

Individuals were then classified according to hypothesized group membership on the following basis: If the subject's linear discriminant score (LDS) was greater than or equal to $\underline{L}$, his group membership was predicted to be Special Forces; if his LDS was less than $\underline{L}$, his membership was predicted to be the NSF group, where

$$\underline{L} = \frac{\overline{LDS}_{sf} + \overline{LDS}_{nsf}}{2} .$$

These predicted classifications were then compared with actual group membership to determine accuracy of the classification procedures and, accordingly, the extent to which the criterion tests accurately discriminated between SF and NSF personnel.

Multiple Regression Analysis. The main objective of the validation activities was to determine what weighted combination of predictor test scores maximally predict SIAF performance. This objective was accomplished through the use of Multiple Regression Analysis procedures.

Since it is reasonable to assume that the various SIAF activity areas represented by the criterion tests do not contribute equally to overall SIAF performance, it was decided to weight the scores differentially. The weights were determined as follows: Four military experts (retired field-grade officers) rated each criterion separately in terms of its importance to overall SIAF performance on a 10-point scale ("1" being least important and "10" most important); median ratings for each criterion were computed and constituted the weight given to the criterion measure. Table 6 shows the weights derived by this procedure.

Table 6

Standardized Criterion Scores and Weights Used to Compute Weighted Criterion Score

i	Standardized Criterion Score (y_i)	Weight (a_i)
1	SIAF Knowledge and Skill Test Score	4.5
2	SIAF Confidence Inventory Test Score	6.0
3	First Aid Test Score	5.5
4	Radio Communication Test Score	8.0
5	Fire Support Test Score	8.5
6	Patrolling Test Score	10.0
7	Claymore Mine Test Score	6.5
8	Target Detection Test Score	7.5
9	Hand Grenade Test Score	6.5
10	Rope Climb Test Score	5.5
11	Swimming Test Score	2.0
12	Five-Mile March Test Score	8.5
13	Helicopter Insertion Test Score	3.0
14	M16A1 Rapid Reaction Test Score	8.5
15	M16A1 Immediate Action Test Score	5.0
16	M79 Target Firing Test Score	6.5
17	M79 Immediate Action Test Score	5.0
18	M60 Target Firing Test Score	7.0
19	M60 Immediate Action Test Score	6.5
20	Land Navigation Test Score	9.0

SIAF performance was defined as a weighted sum of the 20 standardized criterion scores. Thus, the weights shown in Table 6 were used to compute a weighted criterion score (WCS) for each subject using the formula

$$WCS = a_1y_1+a_2y_2+\ldots\ldots+a_{20}y_{20}$$

where a_1 through a_{20} are the first through the 20th weights and y_1 through y_{20} are the first through the 20th standardized criterion scores for a subject.

At this point, the subjects were divided into two samples for validation and cross-validation purposes. For SF and NSF personnel, considered separately, Social Security account numbers (SSAN) were ordered from high to low. Within each group, subjects with the first 50 lowest SSANs were designated as the validation sample. Thus, the validation sample contained 100 individuals, with equal numbers from Special Forces and non-Special Forces personnel. The remaining subjects comprised the cross-validation group.

Using program BMDO2R, Stepwise Regression (Dixon, 1970), stepwise multiple regression procedures were used to determine (a) the combination of predictor test scores that provides the highest possible multiple correlation with the WCS, and (b) the equation for the prediction of the WCS. The *F* values that were used to determine inclusion and deletion of prediction test scores were .01 and .005, respectively; tolerance level of the program was set at .001. These values were selected so that the stepwise regression process would continue until the point was reached where the addition of new prediction test scores had an insignificant effect upon the magnitude of the multiple correlation coefficient, *R*. Thus, tests which were found not to contribute to prediction were deleted from the battery.

Cross-Validation of the Prediction Tests. As a test for reliability of the prediction equation developed in the validation analysis, a cross-validation analysis was conducted upon scores of the previously mentioned cross-validation sample. The purpose of this analysis was to verify the generality of the prediction equation developed in the validation analysis.

Using the prediction values from the regression analysis, the equation

$$WCS = b_1x_1 + b_2x_2 + \ldots\ldots + b_kx_k$$

for the tests that were retained in the battery was applied to compute a predicted WCS for each subject in the cross-validation group; this set of predicted WCSs was correlated with the set of actual WCSs.

Preparation of Final Battery and Other Materials

The Stepwise Multiple Regression procedure provides statistics that indicate the best combination of measures to predict a criterion; where the initial number of prediction instruments is large, the final combination usually consists of a smaller number of tests because omitted tests would have added little, if anything, to prediction effectiveness. Since some of the initial tests simply did not contribute any additional value to predictions, discarding these tests results in a better battery and, most important, total administration time for the battery is reduced. Thus, those tests that were found to add little or nothing to predictability were discarded, and the remaining tests were then integrated into the final SIAF Selection Battery.

In addition to the tests, several other types of materials are needed in order to use the battery efficiently. Accordingly, as the product of the SIAF Selection effort, there was developed a set of materials which includes (a) a handbook for managers of selection programs, (b) a test administration manual, and (c) copies of all tests, including sample answer forms.

RESULTS

COMPOSITE TRAINING TEST

Phase III development efforts that were concerned with training resulted in the production and delivery to the sponsor of a document entitled *Composite Training Evaluation.* It was specifically designed to meet the sponsor's requirement for a test to be used to evaluate the SIAF training materials developed in Phase II. In addition, the test was also designed for additional use by both tactical unit commanders and training facility commanders to evaluate training conducted within the SIAF training program, to evaluate performance of recipients of such training, and to serve as a diagnostic device for identifying training deficiencies.

The Test Document

The *Composite Training Evaluation* is composed of six descriptive/instructive sections and three appendices.

Introduction. This section provides a brief description of the document, reviews the background of the SIAF concept, states the objectives and scope of the test, and explains the assumptions regarding personnel and training on which the test is based.

Evaluation Design. This section provides the rationale for the test, explains the testing methodology in detail, and explains the personnel, terrain, and equipment requirements of the test.

Conduct of Evaluation. This section contains the three field exercises—phases—that comprise the composite training test. First, there is a description of the overall tactical situation ("scenario") on which the initial situations of the phases are based. Then, the phases are presented in the sequence in which they are intended to be administered to test participants.

Each phase is presented in what is, in effect, scenario form. It consists of a general description of the phase, a sequence of events showing the places they are to occur and the approximate time of occurrence, a schematic of the phase, and a continuing series of situations within which the activities of the phase occur.

Each situation establishes, explains, or directs:

Friendly Information and Actions—the friendly situation as it is to be perceived by the test participants.

Aggressor Information and Actions—the enemy situation and enemy activities as these are to be perceived by the test participants.

Material Placement—as required to create the situation realistically.

Requirements (Actions Desired)—the actions which can be expected to result from the demand characteristics of the situation.

Objectives (Aim of Action)—the activities that are to be evaluated.

Evaluation Control Plan. This section contains necessary information concerning evaluation procedures. The subsections are: A - General, including evaluation control and conduct of evaluators; B - Selection of Evaluators; C - Evaluator Instructions; D - Evaluator Organization; E - Evaluator Training; and F - Aggressor Instructions.

Performance Scoresheet/Checklist. This section prescribes the standards and procedures for rating performance and recording ratings on the scoresheets/checklists contained in Appendix C.

Orientation and Critique Plan. This section contains instructions for the preparation and conduct of a pre-test orientation and post-test critiques.

Appendices. The following appendices are included:

Appendix A - References. A list of the key training publications, other than Program Descriptions of the SIAF training program, on which the test is based.

Appendix B - Evaluation Supporting Documents. A list of the training documents required to be prepared by administrators to prepare, conduct, and supervise the test.

Appendix C - Scoresheets/Checklists. The scoresheets/checklists to be used in obtaining and recording ratings assigned to test participants' performance in accomplishing tasks encompassed by test situations. The scoresheets/checklists contain 898 rating factors, of which 349 are considered to be "major factors." A summary of rating factors by phase is shown in Table 7.

Table 7

Summary of Rating Factors by Phase

Phase Number	Major Rating Factors	Total Rating Factors
I	115	314
II	119	320
III	115	264
Total	349	898

Product Delivery

One hundred and twenty-five copies of the *Composite Training Evaluation* were delivered to the sponsor on 1 September 1971. Delivery of the document completed all requirements for the development of materials and procedures for training SIAF personnel.

SIAF SELECTION PROCEDURES

Activities related to the final development of procedures for selection of SIAF personnel were concerned with (a) specification of minimal acceptable standards to be used in preliminary screening of applicants, and (b) validation of the Selection Battery and development of materials for its administration.

Screening Standards

Results of the survey of current practices indicate that, when used in conjunction with the SIAF Selection Battery, the standards discussed below will ensure the procurement of individuals who will be capable of completing SIAF training and of performing satisfactorily in SIAF units. The standards pertain to qualifications considered to be essential for SIAF duty but which do not come within the purview of the tests included in the battery.

Unit Commander Recommendation. Each candidate should be recommended for SIAF duty by his current unit commander. The recommendation need not be addressed to specific qualities of the candidate but should indicate that, in the opinion of the commander, he will be suitable for SIAF duty. The purpose of the recommendation merely is to ensure that some responsible individual who has current knowledge of the candidate knows of no significant reason why he would not succeed in a SIAF unit.

Medical Review. The survey of current practices revealed that all of the surveyed units require medical examinations which are intended to identify individuals with medical conditions that may interfere with on-the-job performance. Furthermore, applicants are required to possess a physical profile which does not limit the type of assignment they can receive.

Since the medical standards for Airborne, Ranger, and Special Forces training (U.S. Army Regulation 40-501) are directed toward the selection of individuals who are capable of performing tasks similar to, or the same as, most of the tasks identified in the SIAF task analysis (Olmstead and Powers, 1970), it was concluded that these medical standards are suitable for screening applicants for SIAF training. It was further concluded that applicants should possess a physical profile that will not limit the types of activities they can perform (e.g., a Code A PULHES profile[1] or its equivalent).

In addition to the above medical standards, the following conditions are sufficient reasons for the rejection of an applicant: (a) severe fear of the dark, (b) severe and prolonged insomnia, (c) somnambulism, (d) claustrophobia, and (e) severe night fears. Applicants with such problems would be likely to impair the success of SIAF missions since any one of the problems could compromise the security of a SIAF unit.

In applying the above standards, at least two practical considerations are relevant. First, if SIAF personnel are to receive training not covered by the SIAF training program (e.g., underwater demolitions or scuba diving), they should also meet the medical standards peculiar to that area of training. Second, a special examination need not be required to determine an applicant's present medical condition if he has had a medical examination of sufficient detail within one year of his application, and if a record of this examination is available for review by a medical officer; additional tests or a new medical examination should be performed if the previous examination and/or health records are not detailed enough for determining the applicant's acceptability.

Physical Conditioning Tests. The physical training program developed for use during SIAF training (Program Description No. 8, "Physical Conditioning and Combatives") was designed to meet SIAF operational requirements by providing training in combat-related skills and teamwork in order to achieve a high state of physical conditioning for each SIAF member. To complete this training, the trainee must be in acceptable physical condition. An indicator of acceptable physical condition is a minimum score of 300 points in the U.S. Army Physical Combat Proficiency Test (PCPT) or a similar level of achievement on comparable tests.

The results of the survey of current practices and the high standard of physical condition required for entrance into the SIAF physical conditioning program, taken together, suggest that the minimum physical requirement for acceptance into the SIAF program should be a minimum score of 300 points on the U.S. Army PCPT, with a minimum score of 60 points on each of the PCPT subtests (the horizontal ladder test, the dodge-run-jump test, the one-mile run, the grenade throw, and the 40-yard low crawl). In addition, it was concluded that the applicant should be able to swim unassisted at least 50 meters without equipment and wearing swimming trunks. Application of these requirements should be strict since only individuals in the best of physical condition will be capable of completing the SIAF physical conditioning program with any degree of success.

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[1] PULHES is a physical profile serial code where P represents physical capacity, U represents upper extremities, L represents lower extremities, H represents hearing, E represents eyes, and S represents psychiatric. An individual is said to have a Code A profile when his profile serial is composed of ones, i.e., when it is 11111.

Educational/Cognitive Requirements. The review of current practices revealed that only one of the surveyed units required applicants to have attained a specific educational level. Evidently educational level is not considered very important in the selection of individuals for existing organizations that engage in activities similar to those envisioned for SIAF units.

However, the review did show that extant units consider measurement of general cognitive ability highly important in the selection of their personnel. Only those applicants with above-average cognitive ability or aptitude as measured by some type of test are accepted. Thus, most of the surveyed units prefer to obtain direct evidence of an individual's general cognitive ability or intelligence through use of their own tests rather than depend upon the indirect and less recent measurement provided by the individual's educational achievement.

The results of this review indicate that educational achievement should not be an important consideration in selecting SIAF team members. Instead, tests of intelligence and cognitive ability that predict or relate to SIAF on-the-job performance should be a critical aspect in the SIAF selection process. (Such tests are included in the SIAF Selection Battery.)

Age. The survey of current practices revealed that the median minimum age requirement was 18 years while the median maximum age was 30.5 years. In two cases (the U.S. Army Airborne Course and the Australian SASR) where there was a maximum age limit, special provision was made for admitting personnel of higher rank over the maximum age limit to fill vacancies.

Taking into account current practices, as well as the training and type of duty envisioned for SIAF applicants, it was concluded that the minimum acceptable age for a SIAF applicant should be 18 years and the maximum 30 years. When vacancies occur in the upper ranks of SIAF organizations, or a special skill is required, personnel over the maximum age limit should be allowed to apply and enter into the selection process provided they meet physical and medical standards. Individuals who are over 36 years of age should receive a special physical examination, to include electrocardiogram, to determine whether (a) their condition is such that they can complete the physical portion of SIAF training and (b) they possess sufficient stamina to successfully complete SIAF missions.

Personal Conduct. The survey of current practices indicated that units which specify certain levels of personal conduct as requisites for entrance into their programs deem it important to exclude individuals with histories of antisocial or criminal behavior. It was concluded that similar standards of personal conduct should be established for selection of personnel for SIAF assignments. Therefore, for admission to the SIAF program: (a) applicants with more than 30 days lost time during current and last previous enlistment should not be accepted; (b) applicants with civilian and/or military criminal records which demonstrate a continuing history of criminal or antisocial behavior should not be accepted; (c) applicants with civilian and/or military criminal records who have demonstrated by subsequent records of "good" behavior that they have been rehabilitated should be accepted; and (d) applicants undergoing, or who have been recommended for, court-martial should not be accepted until they are cleared of all charges that have been brought against them. Finally, an applicant's overall conduct and efficiency ratings from his DA Form 20 (Enlisted Qualification Record) or equivalent should reflect a record of good conduct.

Obligated Time. An applicant's remaining time on active duty after finishing SIAF training should be sufficient to provide the military service with a period of utilization commensurate with training time and expense. The minimum acceptable utilization time must be determined by the requirements of the respective Services; it appeared to the project staff that this time should be not less than 18 months.

Test Validation

For the Phase III validation of the selection tests, administration of both prediction and criterion tests to 100 Special Forces (SF) personnel and 100 randomly selected Army personnel who were not Special Forces (NSF) was planned.

Subject Attrition. Ninety-seven SF and 98 NSF personnel initially appeared for testing. Of these subjects, 27 (27.8%) of the SF personnel and 28 (28.6%) of the NSF personnel did not finish the testing program or their scores were incomplete. Data on these individuals were omitted from the analysis.

To determine whether the proportion of SF and NSF personnel who did not produce complete test data differed significantly, the *z* statistic for comparing two proportions (Miller and Freund, 1965) was computed and compared with the critical *z* statistic for the .05 level of significance. The two proportions were not significantly different, so it is reasonable to conclude that the groups did not differ with regard to attrition.

Verification of the Predictor Discriminant Analysis. In Phase II, it was shown that the tentative selection battery could satisfactorily discriminate between SF and NSF personnel (Olmstead *et al.*, 1971). In order to verify the power of the battery to discriminate, the Linear Discriminant Function (LDF) obtained in Phase II was used to generate Linear Discriminant Scores (LDS) from the raw scores of the 140 SF and NSF personnel who were tested in Phase III.

Table 8 presents summary data for the two groups and shows a significant difference between the mean Linear Discriminant Scores ($t = 7.05, p < .01$). Therefore, in view of the results of Phases II and III, it is concluded that the selection tests satisfactorily discriminate between individuals with characteristics similar to those desired for SIAF personnel and randomly selected Army personnel, and that the discriminatory power of the tests is stable. Figure 2 shows the frequency distributions of the Phase III LDSs by group and illustrates the extent to which the tests discriminate between SF and NSF personnel.

Linear Discriminant Scores were then used to classify each subject as being "like SF" or "like NSF" according to the same classification criterion used in Phase II.[1]

Table 8

Summary of Linear Discriminant Scores for Special Forces and Non - Special Forces on SIAF Selection Tests

Group	N	Mean	SD	*t*	*p*
Special Forces	70	.1813	.0209	7.05	.01
Non - Special Forces	70	.1545	.0243		

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[1] If a subject's LDS was greater than or equal to L = .16852, he was classified as "like SF." If his LDS was less than L = .16852, he was classified as "like NSF."

Frequency Distributions of Predictor Linear Discriminant Scores by Group

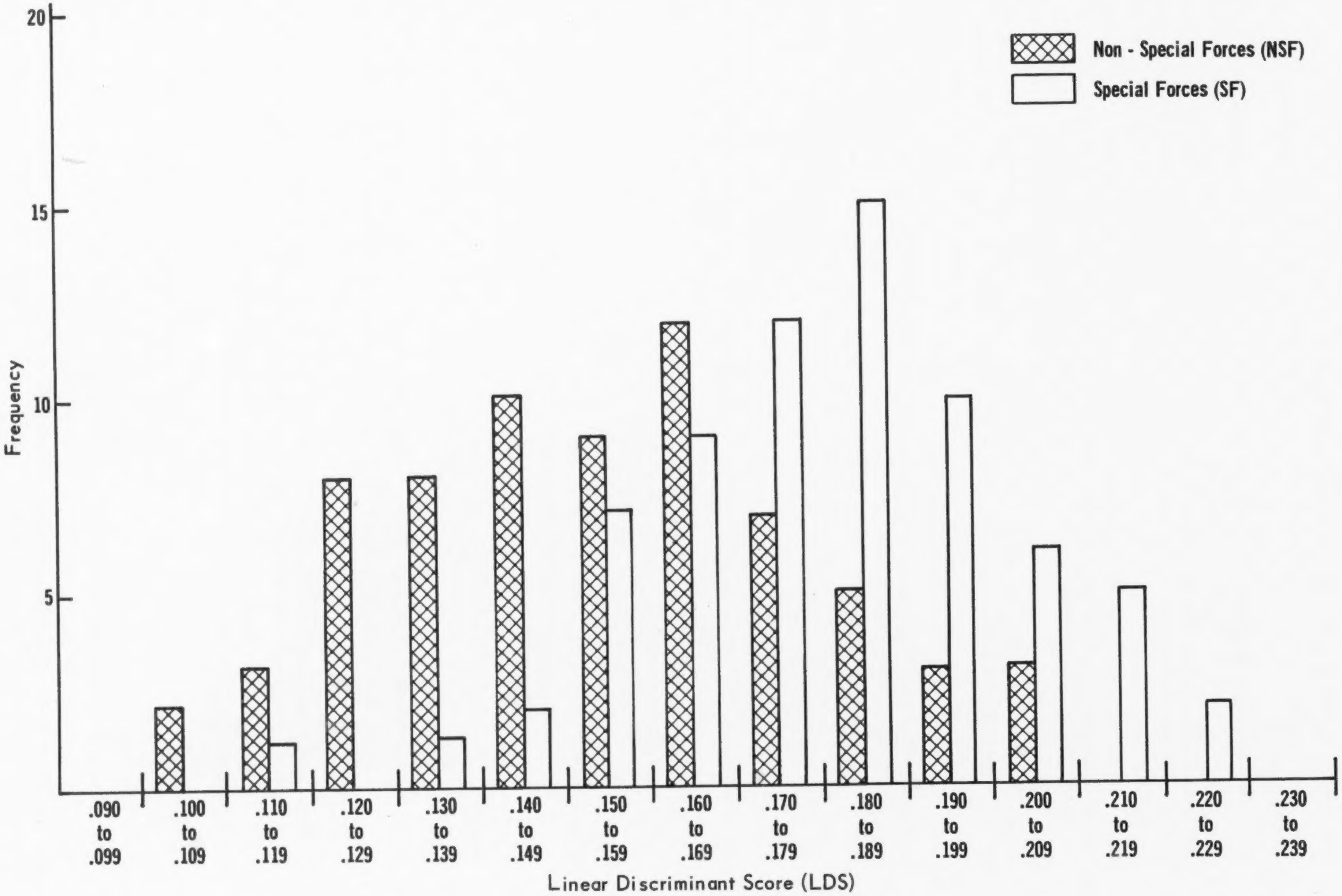

Figure 2

The percentage of correct classifications was 71.4%, a reduction of 19.1% from the accuracy of Phase II (90.5%), in which 92.1% of NSF and 88.7% of SF personnel were correctly classified.

While shrinkage from applying an equation derived from one group to another is undoubtedly present, at least a part of the reduction in discriminability is explained by the fact that NSF personnel in Phase III scored higher than those in Phase II, thereby resulting in greater overlap between the SF and NSF score distributions (see Figure 2). NSF personnel in Phase III were members of the 82nd Airborne Division, while NSF testees in Phase II were TO&E personnel from the U.S. Army Combat Development Command Experimentation Center at Hunter Liggett Military Reservation, Calif. Airborne-qualified personnel are a more select sample of individuals than the usual TO&E personnel and it was not unexpected to find that scores of Airborne personnel were somewhat closer to those of Special Forces than were scores of randomly selected soldiers. However, the finding of a significant difference between the groups in Phase III confirms the power of the tests to discriminate between "SIAF-like" individuals and those who do not possess such characteristics.

Discriminant Analysis of Criterion Tests. In order to determine whether SF and NSF personnel performed differently on the criterion tests, Hotelling's T^2 statistic was computed to simultaneously test the differences between the means of the 20 standardized criterion test scores for the two groups. The obtained value of T^2 was 727.30, $F = 31.36$ ($p < .01$, $df = 20$ and 119). The mean differences, considered simultaneously, were significant, which indicates that the two groups of subjects performed differently on the criterion tests. Table 9 presents means and standard deviations (SDs) of standardized criterion scores for the two groups of subjects. Performance of Special Forces personnel was superior to NSF personnel on 19 of the 20 tests, indicating that, overall, individuals selected and trained for Special Forces perform SIAF tasks better than individuals who are not so selected and trained.

Since the significant T^2 indicated that criterion scores for the two groups were different, it was permissible to test the accuracy with which the criterion tests could correctly identify group membership of individuals. Accordingly, a Linear Discriminant Function (LDF) for 20 criterion scores was computed using program BMDO4M (Dixon, 1970), and the coefficients were used to derive Linear Discriminant Scores (LDS) for predicting group membership. An LDS was computed for each subject using the formula $\mathrm{LDS} = \sum_{i=1}^{20} \lambda_i y_i$, where λ_i is the i^{th} LDF coefficient and y_i is the i^{th} standardized criterion score. Each individual's predicted group membership was calculated using the following criterion: If subject's LDS was greater than or equal to $\underline{L} = \dfrac{\overline{\mathrm{LDS}}_{sf} + \overline{\mathrm{LDS}}_{nsf}}{2}$, his group membership was predicted to be the SF group; but if his LDS was less than $\underline{L}$, his membership was predicted to be the NSF group. The obtained $\underline{L}$ was $-.4953$. Figure 3 shows the frequency distribution of criterion LDSs by group and illustrates the extent to which the scores correctly predicted group membership.

In 98.6% of the cases, SF as well as NSF membership was correctly determined. Therefore, the overall rate of correctly forecasted group membership was 98.6%.

Taken together, the results indicate that the two groups of subjects responded differently to the criterion tests. Furthermore, SF performance was superior to NSF performance on all criterion tests with the exception of the Physical Condition March test. This result indicates that the SF personnel tested during Phase III had a greater amount of knowledge and skill relevant for SIAF at their disposal than did the NSF personnel. Since Special Forces can be assumed to be similar to SIAF units, it can be concluded that the criterion tests are representative of SIAF performance.

Table 9

Criterion Test Performance of Special Forces and Non - Special Forces Personnel[a]

Criterion Test	Special Forces		Non - Special Forces	
	Mean	SD	Mean	SD
SIAF Confidence Inventory	55.6	5.6	44.4	10.4
SIAF Knowledge and Skills Test	58.2	5.3	41.8	6.1
First Aid Test	57.3	4.8	42.8	8.8
Radio Communication Test	51.4	9.0	48.5	10.7
Fire Support Test	55.8	6.8	44.2	9.9
Patrolling Test	56.6	7.0	43.4	8.1
Claymore Mine Test	52.1	7.1	47.9	11.9
Target Detection Test	52.6	10.0	47.4	9.4
Hand Grenade Throw Test	51.2	10.3	48.8	9.6
Physical Condition Rope Climb	48.4	11.1	51.6	8.5
Physical Condition Swimming	51.9	7.0	48.1	12.0
Physical Condition March	51.9	7.1	48.1	12.0
Helicopter Insertion Test	58.3	6.2	41.6	4.9
M16 Rapid Reaction Test	51.9	9.5	48.1	10.2
M16 Immediate Action Test	53.6	2.2	46.4	13.0
M79 Target Firing Test	51.7	8.1	48.3	11.4
M79 Immediate Action Test	52.0	6.0	48.0	12.5
M60 Target Firing Test	51.6	8.5	48.4	11.1
M60 Immediate Action Test	53.4	5.0	46.6	12.4
Land Navigation Test	53.9	10.0	46.1	8.4

[a] Scores are standardized criterion scores. On all tests except the Physical Condition Rope (PCR) and the Physical Condition March (PCM) tests, larger scores indicate better performance. Scores for the PCR and the PCM tests were based on the amount of time required to complete each test and, accordingly, lower scores indicate better performance.

Prediction of SIAF Performance. For validation of the SIAF Selection Battery against a criterion of SIAF performance, a sample (N = 100) containing equal numbers of SF and NSF personnel was drawn as described in the Method section. Selection test scores and weighted criterion test scores for this sample were then included in computation of a Stepwise Multiple Regression analysis. The stepwise regression process was continued until 23 of the prediction tests were entered into the regression equation; the program then terminated because the remaining prediction tests did not meet the criterion for inclusion in the equation. Table 10 presents multiple correlation coefficients (*Rs*) and Standard Errors of the Estimate (SE) for each step of the multiple regression process.

Table 10 shows that the SE of the estimate decreased through the 13th step of the stepwise regression. The SE then began to increase and did not decrease further with the addition of other prediction test scores. Furthermore, the multiple correlation coefficient did not increase significantly after the 13th step. Therefore, the 13th step appears to be the breaking point and the equation that resulted at the 13th step in the regression process was chosen for prediction of SIAF performance. At the 13th step, R was .73 which is highly significant ($F = 7.45$, $p < .01$, $df = 13$ and 86); the SE of R was .051 and the 99% confidence limits of R were .60 to .86.

Frequency Distributions of Criterion Linear Discriminant Scores by Groups

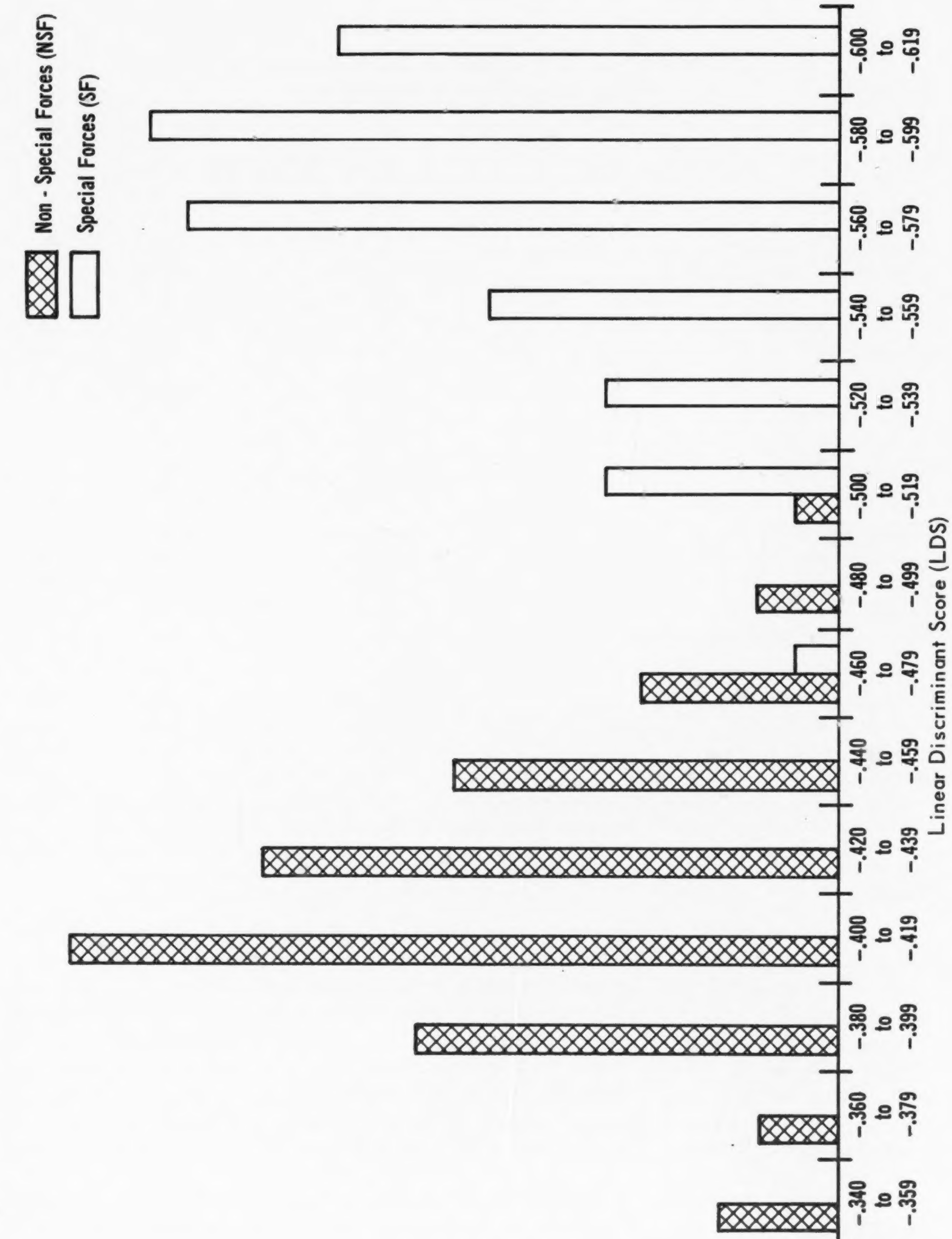

Figure 3

Table 10

Multiple Correlation Coefficients and Standard Errors of the Estimate at Each Step of the Stepwise Multiple Regression

Step	Multiple Correlation Coefficient (*R*)	Standard Error (SE)
1	.45	514
2	.54	486
3	.59	470
4	.62	456
5	.64	450
6	.66	446
7	.67	443
8	.68	437
9	.69	432
10	.70	430
11	.71	426
12	.72	421
13	.73	421
14	.73	422
15	.73	422
16	.74	422
17	.74	423
18	.74	426
19	.74	426
20	.74	428
21	.74	430
22	.74	433
23	.74	436

Table 11 lists the tests included in the final SIAF battery and shows the percentage of criterion variance associated with each test and each type of test. Tests that measure cognitive abilities accounted for 32.6% of the predictable criterion variance tests that measure interests and motivation accounted for 23.8%. The one test that measures physical endurance accounted for 2.5% of the predictable variance. Two tests, the ACB Automotive Information (AI) and the Auditory Number Span (ANS), acted as suppressor variables, that is, their effects on prediction are to improve the prediction efficiency of other variables. Inspection of the correlation between these two tests as well as the correlations of each with the other tests did not reveal any obvious reason for the suppressive action.[1]

Thus, in the final validation, 13 tests, in combination, were found to maximally predict SIAF performance. For this battery of tests, the initial validity coefficient was

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[1] The intercorrelation matrix for the prediction test scores included in the final SIAF battery and the weighted criterion score is presented in Appendix B.

Table 11

Final SIAF Selection Battery and Criterion Variance Predicted by Each Test

Test	Percent of Criterion Variance[a]
Cognitive Ability	32.6
Embedded Figures	7.5
Word Grouping	6.8
Verbal Classification	5.8
Word-Number	.9
ACB Arithmetic	5.9
ACB Army Clerical Speed	5.7
Physical Endurance	2.5
Interest-Motivation	23.8
Team Task Motivation	12.7
Military Interest Blank (Fighter Score)	6.3
Life History Inventory (Fighter Score)	3.7
Background Despair	1.1
Suppressors	[5.9]
ACB Automotive Information	[4.9]
Auditory Number Span	[1.0]
Total SIAF Selection Battery[a]	53.0

[a] The total percentage of criterion variance predicted equals the sum of percentages for predictive variables (underscored) less the sum of percentages for suppressor variables (shown in brackets).

.73. The Coefficient of Multiple Determination, R^2, was .53, which indicates that the battery of 13 tests accounts for 53% of the criterion variance.

The Prediction Equation. In order to use a test battery for selection purposes, a prediction equation is needed. The equation indicates the weights to be given each test in computation of an overall score and provides the bases for expectancy tables and for decisions concerning the acceptability of applicants. Accordingly, a prediction equation was derived from the data resulting from the multiple regression analysis. The equation for multiple regression as applied to the present data is:

$$PSB = a + b_1X_1 + b_2X_2 + \ldots\ldots b_{13}X_{13}$$

where PSP is Predicted SIAF Performance, a is a derived constant, b_1 is the regression coefficient for the first test, X_1 is the individual's raw score for the first test, and b_{13} and X_{13} apply in similar fashion to the 13th test in the battery. Thus, where the constant and regression coefficients are known, the Predicted SIAF Performance score for an individual can be determined by inserting his raw test scores into the equation appropriately and completing the computations. Table 12 shows the constant, a, and the regression coefficients, b, to be used in the prediction equation derived from the present data.

Table 12

Constant and Regression Coefficients for Prediction of SIAF Performance

Test	Regression Coefficient
Auditory Number Span	19.56
Embedded Figures	16.39
Verbal Classification	7.78
Word Grouping	19.29
Word-Number	−19.05
Life History Fighter Score	18.02
Military Interest Fighter Score	4.91
Background Despair Score	−38.05
Team Task Motivation	44.57
ACB Arithmetic	4.17
ACB Army Clerical	4.08
ACB Automotive Information	−6.08
Physical Endurance	−76.40
Constant = 4680.26	

Cross Validation. For the sample of 100 subjects, the validity coefficient (R) for the selection battery was .73. As a check on the stability of the validity, a "cross-validation" procedure was performed, using Scores of the 40 remaining subjects, who had been withheld from the original validation group.

The prediction equation described above was used to compute a predicted criterion score for each subject. Then, a Pearson product-moment correlation was computed between predicted scores and actual weighted criterion scores for the sample. The obtained correlation coefficient was .41, which is statistically significant ($F = 7.82$, $p < .01$, $df = 1$ and 38. A correction for shrinkage was computed for the original sample of 100 and the result was a corrected R of .63. To determine whether the R corrected for shrinkage was significantly different from the correlation obtained from the cross-validation sample, the test for significance between two correlation coefficients (Edwards, 1965) was performed. The obtained value of the z statistic was 1.58 which was not significant at the .01 level. Therefore, it is reasonable to conclude that the true validity coefficient for the selection battery is somewhere close to .63.

Predictive Accuracy. The "payoff" in personnel selection is the accuracy with which tests predict success or failure on performance. To evaluate the predictive accuracy of the SIAF Selection Battery, "success" on the criterion tests was defined as the median of the distribution of 140 weighted scores; individuals who scored at or above the median were classed as "Succeeded," and those below the median were classed as "Failed." Predicted criterion scores were then used to forecast success or failure for all subjects. Finally, actual criterion scores were compared with predicted criterion scores to determine the extent to which the battery predicted actual success and failure.

Table 13 shows the results of the comparison. Seventy-six successes were predicted. Of these, 61 subjects were actually successful and 15 failed. Among the 64 subjects for whom failure was predicted, 53 actually failed and 11 succeeded.

Table 13

Comparison of Predicted and Actual Successes and Failures on SIAF Criterion

Actual Performance	Predicted Performance		Total
	Failure	Success	
Success	11	61	72
Failure	53	15	68
Total	64	76	140

Thus, the battery predicts success—using the prediction criterion as defined above—with 80% accuracy and it predicts failure with 82% accuracy. This means that, if success were predicted for 100 individuals by the battery and they were selected for the SIAF program, 80 would succeed and 20 would fail, an attrition rate of 20%. On the other hand, if failure were predicted for 100 individuals and they were rejected from the SIAF program, 18 who would have succeeded would be rejected, while 82 would have been correctly eliminated.

To the extent that the criterion tests represent SIAF performance, it can be concluded that the SIAF Selection Battery is a valid predictor of performance and provides a significant improvement over chance in the selection of SIAF personnel without the use of the selection battery.

Selection Materials

Effectiveness in a selection program that is based upon psychological tests requires knowledge of standard procedures for their administration, interpretation, and use. Accordingly, the product of the HumRRO effort concerned with selection is a volume entitled "SIAF Selection Procedures," which contains (a) guidance for managing a SIAF Selection Program, (b) instructions for administering the SIAF Selection Battery, and (c) copies of required materials, such as tests and answer forms. The volume consists of five parts:

(1) SIAF Selection Program Administration Handbook—provides guidance to managers of SIAF Selection Programs. It includes a brief discussion of the rationale, use of screening procedures and tests, and recommendations for selecting SIAF personnel.

(2) SIAF Selection Battery Administration Manual—contains specific instructions for administering the SIAF Selection Battery.

(3) SIAF Selection Battery Scoring Booklet—contains instructions for scoring the tests which comprise the SIAF Selection Battery.

(4) SIAF Selection Battery Test Booklet—contains copies of the tests which comprise the SIAF Selection Battery.

(5) SIAF Selection Battery Answer Booklet—contains copies of the forms upon which testees enter their responses to the tests that comprise the SIAF Selection Battery.

DISCUSSION

COMPOSITE TRAINING TEST

The development of a valid and sensitive means for evaluating training of the magnitude of the SIAF Training Program is a complex and time-consuming task. However, given systematically engineered training and a sound approach to evaluation, a set of test situations and administrative rules can be designed that will provide the information required to make a valid determination of the effectiveness of training procedures.

Of greatest difficulty to the test designer is the identification of specific criteria by which the test participants can be accurately judged. In the present project, the previously specified Knowledges and Skills and Terminal Training Objectives for each subject matter area provided a firm foundation upon which valid points for evaluation could be based. These evaluation factors and the scoring rules pertaining to them thus comprise a valid standardized procedure for assessing the effectiveness of SIAF training.

It should be noted, however, that the flexibility required by the differing training standards of United States and Allied forces and by the basic approach of permitting the local commander to implement only those SIAF Program Descriptions needed to meet his unit's training requirements precluded stipulation of a single uniform criterion for judging overall SIAF performance. If such a standard is desired by a using Service, it should be developed to reflect the specific training philosophy and particular standards of that Service, as well as the local conditions prevailing in the environmental area where the test is conducted.

A final conclusion from this research effort is that if a training program encompasses a large number of hours and features a wide variety and complexity of subject matter intended to be appropriate for widely differing environments, a single homogeneous field exercise is not capable of testing all aspects of the program. In the present work, it was determined that three separate test phases, each differing on many essential factors, were necessary to incorporate the widest possible range of requirements for presentation to the test group. By using the integrated successive phase approach, instead of a single field exercise, not only is the widest possible range of training made available for assessment, but the environmental conditions under which the test is held can be manipulated to approximate the requirements of specific anticipated operational missions. For the evaluation of large, complex training programs, the successive phase approach appears to be a most feasible means for obtaining genuinely valid data.

The principal purpose of the Composite Training Test is to provide a feasible device for evaluating the effectiveness of the SIAF Training Program materials that were developed by HumRRO. The test which was developed will adequately serve that purpose. However, two added features may, in the long run, far outweigh the original purpose. The Test is also designed to enable commanders who conduct SIAF training, within either SIAF organizations or SIAF training installations, to (a) evaluate the overall effectiveness of their training efforts and (b) diagnose training or operational deficiencies in specific SIAF performance areas. These features of the Composite Training Test make it an operational instrument, enhancing its value much beyond the original purpose.

SIAF SELECTION PROCEDURES

In Phase III, work was devoted to determining the capability of the SIAF Selection Battery to predict performance on criterion tests that represent SIAF requirements and to developing guidance for using the developed procedures to select SIAF personnel. To satisfy these requirements, the following questions must be addressed:

(1) Did the criterion tests in fact measure SIAF performance?
(2) Does the SIAF Selection Battery in fact predict performance on the criterion tests?
(3) What are implications of the results for selection of SIAF personnel?

Evaluation of the Criterion Tests

Systems analysis procedures were used to develop the criterion tests. That is, the criteria were based upon systematically identified performance requirements, which, in turn, had been derived from mission and task analyses. Strict adherence to prescribed systems analytic procedures assured criterion test validity. Accordingly, confidence that the tests actually measured SIAF performance is warranted.

However, to confirm the validity of the criterion tests, an experimental evaluation was built into the overall validation design. A "known groups" method was used to determine whether the tests could discriminate between two samples of individuals from *a priori* specified populations (Special Forces and Non - Special Forces). When scores derived from the criterion tests were used for blind classification of the subjects according to group membership, classification was correct in 98.6% of the cases. This level of accuracy indicates that not only do the criterion tests discriminate between individuals who possess SIAF skills (Special Forces) and those who do not have such skills (Non - Special Forces), but they also have an excellent functional relationship to job success-the tested abilities are representative of on-the-job performance.

Within this project, the significance of the representativeness and validity of the criterion tests derives from the necessity for acceptable criterion measures against which to validate the prediction tests. The results indicate that the SIAF criterion tests are acceptable.

Validation of the Selection Battery

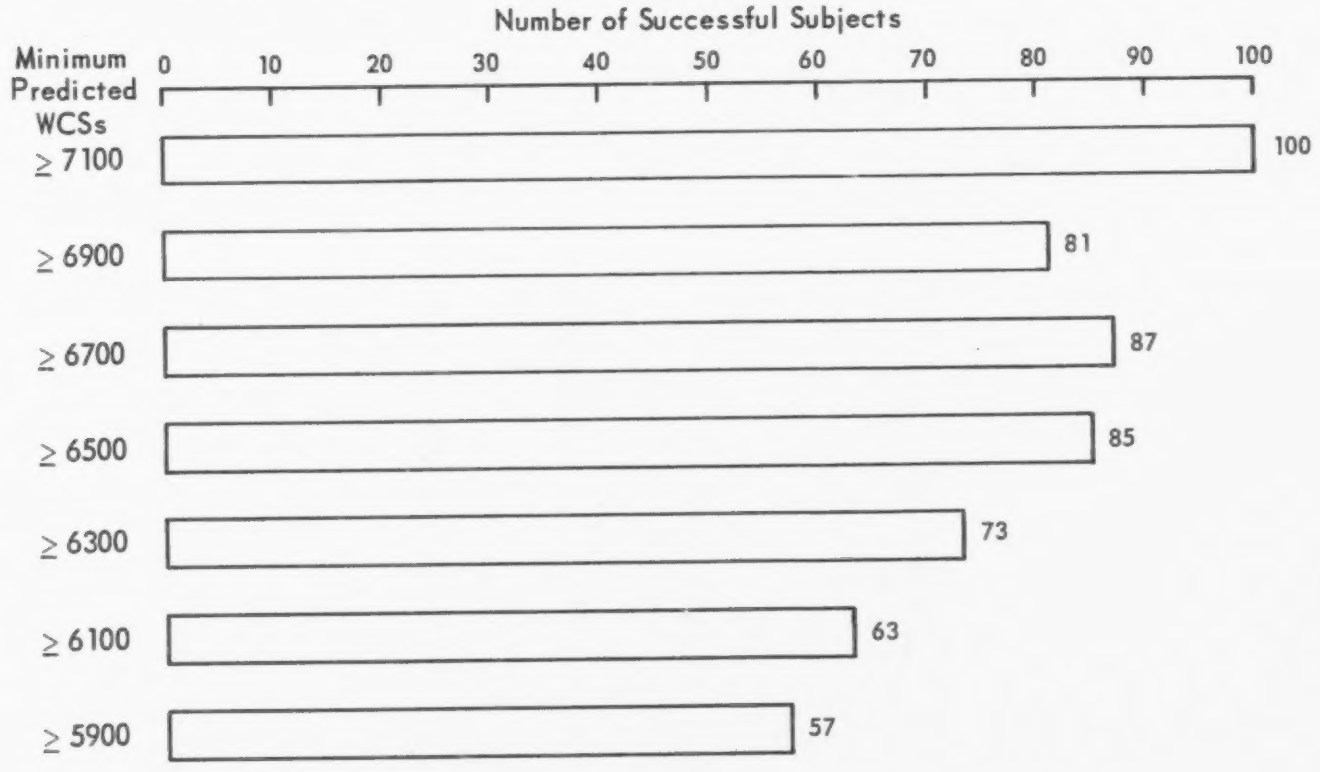
In Phase II, the Selection Battery was "provisionally validated" by use of a "known groups" design, and it was found that the battery successfully discriminates between individuals who possess SIAF skills and those who do not. This finding was confirmed in Phase III. However, the critical test of selection instruments is the prediction of actual performance. The validation study in Phase III showed that scores on the final Selection Battery correlate significantly and positively with weighted composite scores on the criterion measure. Furthermore, an empirically derived prediction equation forecasts success on the criterion with 80% accuracy. Accordingly, it is concluded that the final SIAF Selection Battery is valid for predicting SIAF success.

Interpretation and Use of the Predicted Criterion Score

The Predicted Criterion Score (PCS) is a composite of weighted scores of the various tests that comprise the SIAF Selection Battery. The PCS is computed solely as a means of predicting for an individual the probability of his being successful in SIAF performance. Therefore, an individual's probability of success is estimated by his PCS. Different PCSs indicate different probabilities of success.

To illustrate the range of obtained PCSs and their associated probabilities, an institutional expectancy chart was constructed (Figure 4). To construct this chart it was necessary to provide an arbitrary definition of successful SIAF performance. Successful performance was defined as above-average performance on the criterion tests. The chart shows for each PCS the cumulative percentage of individuals who performed successfully.

Institutional Expectancy Chart Showing Percent of Criterion Successes for Predicted Criterion Scores



NOTE: The irregularity shown for ≥ 6900 is interpreted as chance rather than a meaningful deviation.

Figure 4

For example, 57% of individuals who achieved a PCS of 5900 or higher performed successfully on the criterion tests. In general, as the PCS increases, the percentage of successful individuals increases.

In order to use the PCSs most effectively for selection of the best qualified candidates, the range and distribution PCS scores must be known. Table 14 shows the percentile ranks equivalent to various PCS values for the sample of 100 subjects used in the validation study. The percentile rank shown for a specific PCS indicates the percentage of subjects who scored lower than the specified PCS value. For example, the PCS which is 7000 is associated with the percentile rank of 90; this rank indicates that 90% of the subjects in the validation sample scored lower than 7000. Furthermore, if the percentile rank for a given PCS is subtracted from 100, the value that remains indicates the percentage of subjects who achieved a PCS greater than or equal to the specified PCS. To continue with the previous example, for a PCS equal to 7000, 10% of the subjects in the validation sample achieved a PCS greater than or equal to 7000.

The above data have important implications for selection because they indicate the number of personnel who must be tested in order to obtain a specified number of acceptable individuals. Therefore, the number of personnel who should be tested will be determined by the score which is the breaking point between acceptance and rejection. This score is called the "cutting score." Table 14 shows that as the cutting score increases, the percentile rank also increases and, therefore, a lower percentage of individuals can be expected to achieve an acceptable score. On the other hand, as the cutting score is lowered, a greater percentage of individuals can be expected to achieve a "passing" score.

Table 14

Percentile Ranks and Selection Ratios for Obtained Predicted Criterion Scores

Predicted Criterion Score (PCS)	Percentile Rank	Selection Ratio
7500	100	.00
7100	95	.05
7000	90	.10
6920	85	.15
6860	80	.20
6820	75	.25
6780	70	.30
6740	65	.35
6660	60	.40
6600	55	.45
6540	50	.50
6460	45	.55
6400	40	.60
6340	35	.65
6260	30	.70
6180	25	.75
6120	20	.80
6020	15	.85
5900	10	.90
5780	5	.95

The decision as to which score should be designated as a cutting score should be based on two factors: (a) the probability of success in SIAF performance of candidates who are chosen on the basis of the score, and (b) the availability of applicants from whom selection can be made. In general, a score that will result in a modest attrition rate—that is, a good probability of success—is desirable. However, the scarcity of applicants and severity of requirements for personnel could lead to a decision to lower the cutting score.

At this point, it will be helpful to introduce two concepts that are useful for approaching the problem of selection. The first is the *Success Ratio*—the ratio of the number of individuals who succeed on the job to the number of individuals who are selected. The Success Ratio is a function of the predictive accuracy of the test, and each score on the test will have a somewhat different success ratio. Thus, a PCS of 6340 is associated with a Success Ratio of .75; that is, of every 100 individuals who are selected on the basis of scores of 6340 or better, 75 will succeed in SIAF performance and 25 will fail. Higher scores will have higher Success Ratios; however, it is important to note from Table 14 that fewer individuals will attain higher scores and, therefore, more people must be tested in order to obtain a sufficient number of acceptable personnel.

The second important concept is the *Selection Ratio* which is the ratio of the number of men selected to the total number of applicants. Table 14 shows that the percentile rank of 35 is associated with a PCS of 6340, which means that 35% of the subjects in the validation sample had a lower PCS, while 65% had a PCS of 6340 or greater. Therefore, of every 100 applicants who are tested, 65 will attain a score of 6340 or better. The Selection Ratio for this score is .65. This means that, if it is desired to obtain 65 acceptable individuals, where the cutting score is 6340, it will be necessary to test 100 applicants. Furthermore, the Success Ratio for the score is .75; accordingly, of the 65 individuals who are selected 49 (75%) will be successful in SIAF performance. Table 14 shows Selection Ratios for PCS scores selected on the basis of percentile ranks.

For selection based on the results of this study, a PCS cutting score of 6340 is recommended. This score has a good Success Ratio (.75) and, hence, attrition will not be too severe. On the other hand, the Selection Ratio (.65) is such that a reasonable number of acceptable candidates can be expected—provided sufficient applicants are available. In general, it can be expected that, with this cutting score, 65 applicants out of 100 will be accepted and 49 will eventually perform successfully in SIAF training and operations. A greater Success Ratio can be achieved by raising the cutting score, but it will be necessary to test more applicants to obtain the same number of SIAF personnel.

An important consideration in decisions about levels of acceptability (i.e., cutting scores) is the number of applicants initially available and the number of personnel required. If a large pool of applicants is available and a small number is required, it may be desirable to raise the cutting score because, although fewer will be accepted, those who are accepted will be more likely to be successful. If applicants are limited, it may be necessary to lower cutting scores; this will result in a greater percentage of acceptances, but more of those who are accepted will fail.

Table 15 shows the number of applicants who will be accepted and the number of accepted candidates who will be successful as a function of different numbers of available applicants, when the Selection Ratio is .65 (PCS of 6340).

Use of the Success Ratio. Whether the Success Ratio should be maintained at .75 (PCS of 6340) should be determined by the number of available applicants and the degree of attrition that can be tolerated. Attrition can be reduced by raising the cutting score but, if applicants are few, this action will reduce the number of personnel who

Table 15

Number of Selected Applicants and Successful Candidates as a Function of Available Applicants for a Selection Ratio of .65

Number of *Applicants* Available for Selection	Number of *Applicants* Who Will Be Selected	Number of Selected *Candidates* Who Will Be Successful
10	6	4
20	13	10
30	19	14
40	26	19
50	32	24
60	39	29
70	45	34
80	52	39
90	58	43
100	65	49
150	97	73
200	130	98

enter the program. On the other hand, if more attrition can be tolerated, lowering the cutting score—and, hence, the Success Ratio—will result in the procurement of more candidates, even though they may be of lower quality.

Use of the Selection Ratio. The Selection Ratio is useful only when the number of applicants exceeds the number of vacancies. If there are more vacancies than applicants, and if the vacancies must be filled, the Selection Ratio has no utility.

Whether the Selection Ratio (SR) should be maintained at .65 (PCS of 6340) will depend upon (a) the number of applicants available for selection (A), and (b) the number of vacancies (V) in the program. If the number of applicants available remains more or less constant, the Selection Ratio V/A will approach 100 as V becomes close to the magnitude of A, while V/A will decrease as V approaches zero. This relationship is illustrated in Figure 5.

On the other hand, if the number of vacancies (V) remains more or less constant, the Selection Ratio V/A will approach zero as A becomes large relative to V, while V/A will approach 100 as A becomes closer to the magnitude of V. This relationship is illustrated in Figure 6.

The relationships shown in Figures 5 and 6 are presented solely for illustrative purposes. For the actual Selection Ratios associated with PCS scores developed in this study, reference should be made to Table 14.

In general, the Selection Ratio (.65) associated with the cutting score recommended in this report (PCS of 6340) should be maintained for optimum results in the SIAF Selection Program. If it becomes desirable or necessary to change from the recommended Selection Ratio, two important points should be noted: (1) raising the Selection Ratio will reduce the quality of the applicants accepted, and (2) lowering the Selection Ratio will reduce the number of applicants accepted. How well either of these results can be tolerated is a matter for consideration before the Selection Ratio is changed.

Use of SIAF Screening Procedures

The Screening Procedures which were developed provide minimum standards for acceptance into the SIAF program. These medical, physical, conduct, and age standards ensure that individuals who are accepted will be capable of performing the arduous and stressful duties frequently required of SIAF personnel. When properly administered, the Screening Procedures and the SIAF Selection Battery provide a high probability of selecting personnel who will be effective.

As outlined in the "SIAF Selection Procedures," it is recommended that the Screening Procedures be administered to applicants first. An applicant who passes these procedures would then be given the SIAF Selection Battery for final evaluation and possible acceptance. Use of the Screening Procedures prior to the battery will eliminate many unsuitable applicants and, thus, save the time and personnel required to administer the test battery.

The SIAF Selection Procedures Document

The document entitled "SIAF Selection Procedures" is the product of the developmental work performed by HumRRO in relation to the selection of SIAF personnel. It contains all required information, guidance, and materials for conducting a SIAF Selection Program. As such, it provides field personnel the capability for selecting individuals who will be effective without the need for further guidance or assistance.

Selection Ratio (V/A) as a Function of Increasing Number of Vacancies (V) With Number of Available Applicants (A) Constant

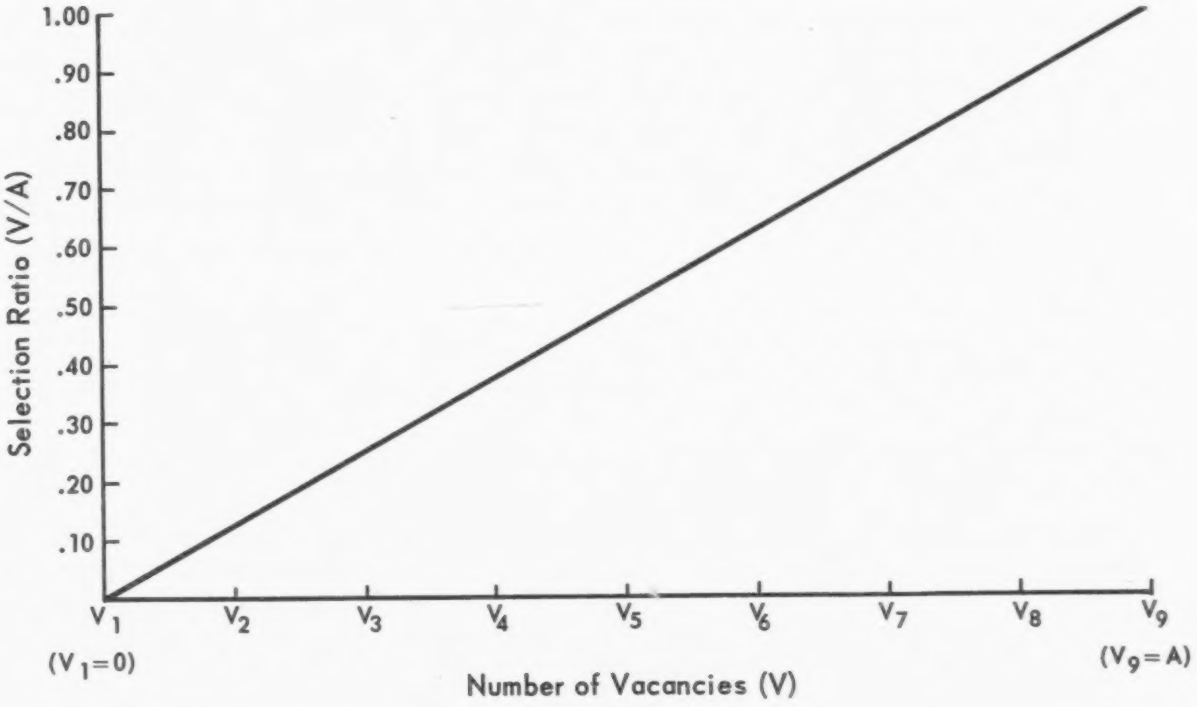


Figure 5

Selection Ratio (V/A) as a Function of Increasing Number of Applicants (A) With Number of Available Vacancies (V) Constant

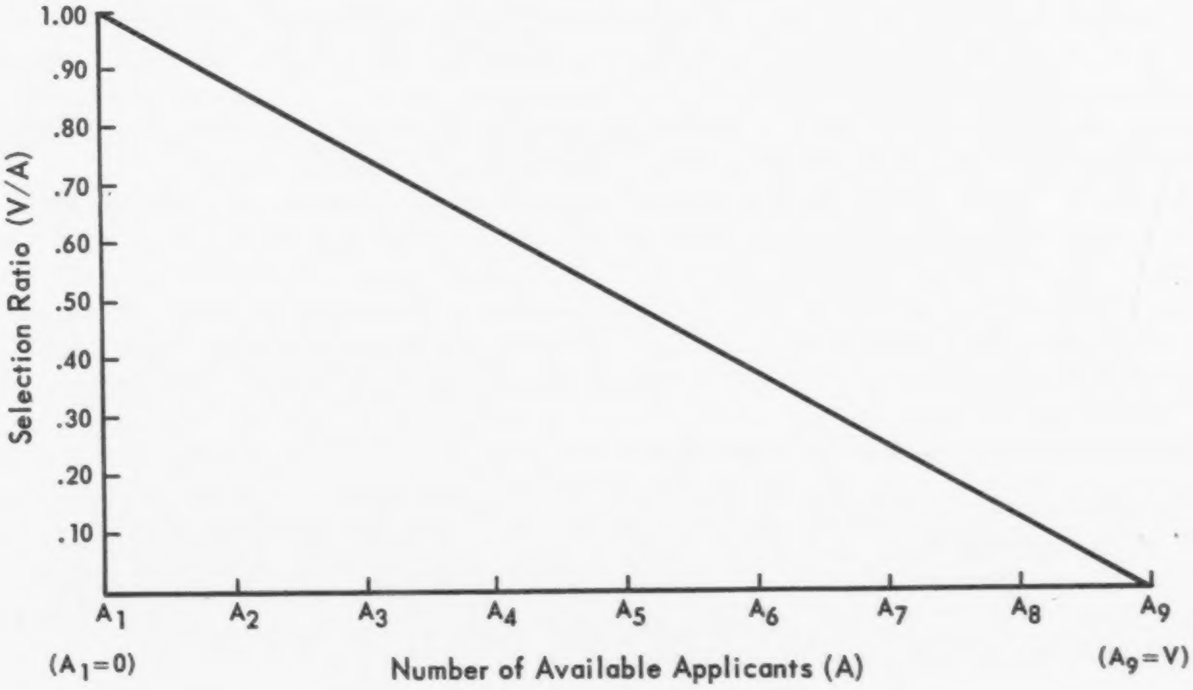


Figure 6

IMPLICATIONS OF THE SIAF SELECTION AND TRAINING PROGRAM

The work accomplished in Phase III completes all requirements for the SIAF Selection and Training Project. The overall objective of the project was to develop procedures for selecting and training personnel to serve effectively in Small Independent Action Forces. This objective was accomplished. The selection and training materials which were developed provide an integrated and effective system for, first, identifying the most likely candidates for SIAF assignment and, second, training them to effectively perform tasks which have been specifically determined to be essential for accomplishment of SIAF missions.

The SIAF Selection Procedures were developed from mission-relevant performance requirements and empirically validated against concrete criteria based upon the same requirements. The result is a set of selection procedures which can be used with a high level of confidence.

The 25 Program Descriptions which comprise the developed SIAF Training Program were specifically designed to meet the operational requirements of SIAF units and to develop high levels of proficiency within SIAF personnel. This training can be administered and used in all environments, although some modifications may be indicated where environmental demands are extreme. The training materials were purposely designed to permit maximum flexibility in administration so that they have the widest possible applicability for both United States and Allied forces.

The use of identified Knowledges and Skills and Terminal Training Objectives as building blocks in the training system provides both quantitative and qualitative support in the area of training design. They provide a highly effective alternative to the questionable use of purely personal opinion about training content needs.

In addition to the required technical reports, the products of the HumRRO SIAF Selection and Training Project were:

(1) Twenty-five separate Program Descriptions, which prescribe training in critical SIAF activity areas.

(2) Guide for the Use of SIAF Program Descriptions, which provides full information and guidance for implementation of the SIAF Training Program.

(3) Composite Training Evaluation, which provides full information, guidance, and materials for evaluating the SIAF Training Program.

(4) "SIAF Selection Procedures," which provides copies of all testing materials and full information and guidance for implementation of the selection procedures.

A fundamental feature of all of the products is their practicability. Because they were developed and written for use by operating personnel, they include all of the information, guidance, and detailed instructions required to implement them without further developmental work.

Aside from the relevance and applicability of the materials, probably the most significant conclusion from the accomplished work is that integrated systems analysis and systems engineering is a valid and feasible approach to the development of effective selection and training procedures. Although systems analysis and engineering is a lengthy and expensive process, it results in a personnel system that is both efficient and relevant to operational requirements. Accordingly, the methodology that was used is highly recommended for future projects of this type.

RECOMMENDATIONS FOR FUTURE RESEARCH

In the present project, HumRRO has produced a fully developed general SIAF training program and effective procedures for selecting SIAF personnel. However, in the course of the work, several problem areas for which future research is recommended were identified. Recommendations for future research are:

(1) *A study to develop a prototype organization for a parent unit of Small Independent Action Forces and guidance for the operation of parent units, to include employment of Small Independent Action Forces.*

The manner in which SIAF teams are directed, supervised, and supported determines the manner in which they may be employed and, to a significant degree, the extent to which their operational potential is realized. Being both organizational and command functions, direction, supervision, and support are best accomplished through and within an established organizational structure. To be maximally effective, such a structure must be designed for and responsive to the specific needs of the operational elements. Viewed in this perspective, the need for a SIAF parent organization is clear.

Ideally, the organization of the Small Independent Action Forces of the various Services would be identical. Practically, however, such an organization would not be capable of meeting the needs of all Services under all circumstances. Rather, the need is for a prototype organization which would encompass the basic SIAF requirements common to all Services while incorporating flexibility sufficient to permit each using Service to adapt and develop, as appropriate to its needs, without altering the basic structure. In the same way, prototype guidance for the operation of parent units and the employment of SIAFs is required.

(2) *A project to develop improved team training procedures for use with SIAF units.*

Small Independent Action Forces must function effectively as well-integrated teams. The necessity for frequent quick reaction in emergency situations raises a requirement for the actions of every team member to complement those of every other member. In the present project, pre-team sensitization and team training were incorporated into training sessions wherever possible. However, there is a need for the development of methods for intensive team training which are specifically tailored to SIAF needs and which will ensure maximum teamwork in SIAF units.

(3) *A project to develop training procedures for Small Independent Action Forces operating in urban environments.*

Large conventional forces can expect to have little success in locating and capturing insurgents in urban environments. However, SIAF teams would possess great potential for operating successfully in such environments when properly trained. The adaptation of SIAF techniques to urban internal defense environments is feasible. The requirement is for training specifically designed to result in the application of SIAF skills in urban environments.

(4) *A project to develop training procedures for Small Independent Action Forces operating in Northern and desert environments.*

The use of small units which operate independently in extreme Northern or desert environments is of increased importance due to the large areas to be covered, anticipated low troop concentrations, and the difficulty of conducting military operations with larger conventional forces. However, the unique characteristics of these environments make many of the identified SIAF skills even more difficult to perform. Examples of activities which may be seriously affected by the peculiarities of desert or Northern environments are land navigation, human maintenance, survival techniques, and use of camouflage, cover, and concealment.

Effective performance of these and other activities requires intensive specialized training that is specifically oriented toward the environment in question. The project would result in Program Descriptions specifically designed to build upon General SIAF training in order to develop high levels of proficiency in skills required to perform effectively in each of the two environments.

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AND
APPENDICES

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Appendix A

CRITERION TESTS

The following tests were administered to obtain measures of effectiveness in activities representative of SIAF performance. Specific areas and tasks included:

1. First Aid

   This test measured the ability of the individual tested to apply the four basic lifesaving steps of combat first aid and to perform a one-man carry of a wounded soldier. Specific performances measured included:

   a. Ability to properly apply artificial respiration to a wounded soldier using either the mouth-to-mouth method or the chest-pressure arm lift system.
   b. Ability to stop heavy bleeding from a limb wound by properly applying pressure to stop the bleeding or through the use of a tourniquet made of available material.
   c. Ability to prevent a wounded soldier from going into shock by applying those precautionary measures which assist in the control of shock.
   d. Ability to properly treat and apply protection to a moderately severe scalp or upper foot wound.
   e. Ability to move a wounded soldier, who is conscious but cannot walk, a distance of 15 meters using either the one-man carry or the firemen's carry with three-step method of standing casualty up and then positioning the casualty on the carrier's back.

2. Radio Communications

   This test measured the testee's proficiency in communicating with the AN/PRC-77 radio—the type of radio that would normally be employed by SIAF-type units. Knowledges and skills addressed during the test included assembly, operation, siting and adjustment; transmitting and receiving; and disassembly. Performances measured included:

   a. Ability to assemble major components of the AN/PRC-77 radio.
   b. Ability to place the radio in operation.
   c. Ability to establish communication with a parent radio point.
   d. Ability to accurately receive/copy a radio message.
   e. Ability to disassemble the AN/PRC-77 radio into major components.

3. Requesting Fire Support

   This test measured the testee's ability to request aerial, initial, and subsequent indirect fire support on targets of the type most likely to be encountered by SIAF units. The test required the testee to transmit a call for aerial fire support using the correct sequence. Following this requirement, the testee was presented with a situation requiring initiation of a request for indirect fire support, using the proper sequence for providing required information, followed by a subsequent fire request. Performances measured included:

   a. Ability to request initial aerial fire support.
   b. Ability to request initial and subsequent indirect fire support.

4. Patrolling

This test measured the testee's ability to react to patrol situations that SIAF personnel are most likely to encounter. Performances measured included:

a. Ability to inspect and detect discrepancies in a patrol member's camouflage.
b. Ability to assume proper battlefield positions (behind trees, low bush, and rocks) and to use proper movement techniques when approaching an objective area.
c. Ability to properly handle prisoners of war in accordance with rules of Geneva Convention.
d. Ability to select patrol routes from a map study.
e. Knowledge of immediate action drills and the proper measures a patrol should follow:
    (1) When confronted with a superior enemy force and:
        (a) There is insufficient time available to prepare fighting positions.
        (b) Your patrol is not detected—is detected.
        (c) Contact is unavoidable.
    (2) When establishing a patrol base.
f. Ability to identify man-made sounds associated with the movement of a combat soldier.

5. M18A1 (Claymore) Mine

This test measured the ability of the testee to properly employ an M18A1 (Claymore) mine in the controlled role. Performances measured included:

a. Ability to select a correct firing position.
b. Ability to properly position the mine to achieve desired results.
c. Ability to aim the mine toward an effective killing zone.
d. Ability to aim and test the mine.
e. Ability to fire the mine.

6. Target Detection Techniques

This test measured the testee's ability to detect enemy personnel on the basis of movement, noise, light reflection, and poor camouflage in a battlefield environment. Performances measured included:

a. Ability to locate stationary and moving personnel targets at ranges from 50-150 meters.
b. Ability to mark the location of targets.
c. Ability to estimate ranges to targets.

7. Hand Grenade

This test determined the testee's skill and confidence in the use of hand grenades against a variety of targets at ranges from 20-35 meters. The testee was required to throw practice grenades from standing, kneeling, and prone positions at targets that SIAF units would be most likely to encounter on operations. Performances measured included:

a. Ability to throw a grenade into a foxhole at 20 meters while standing behind a wall.
b. Ability to throw a grenade into a trench at 35 meters going from a kneeling to a standing position.

c. Ability to throw a grenade at a window at 20 meters while kneeling.
d. Ability to throw a grenade into a window at 25 meters while kneeling behind a low wall.
e. Ability to throw a grenade into a trench at 20 meters going from a prone to a kneeling position.
f. Ability to throw a grenade into a bunker at 20 meters—any position.
g. Ability to throw a grenade into a set of five E-type silhouette targets at 30 meters while kneeling behind a low wall.

8. Physical Conditioning (one area, but three tests)

Three separate requirements were used to measure the physical fitness of the testee and determine ability to perform difficult physical tasks inherent in SIAF missions. The test requirements were representative of those normally associated with entry into SIAF-type units. Performances measured included:

a. Time required to ascend and descend a 16-foot length of one-inch rope suspended 20 feet above the ground while carrying a rifle and a 30-pound pack.
b. Ability to swim 15 meters wearing standard SIAF clothing and carrying a rifle and a 30-pound pack.
c. Ability to complete a five-mile forced march within one hour while wearing a 30-pound pack and carrying a rifle.

9. Helicopter Insertion

This test was used to measure an individual's knowledge regarding helicopter insertions within a combat area. The testee as a member of a SIAF patrol was required to prepare himself and his equipment for a helicopter insertion, board the aircraft, describe proper in-flight procedures and behavior, prepare for aircraft touchdown, and offload, prepared for combat. In addition, the testee was placed in a patrol situation and told to select a suitable landing zone from a map for extraction of the patrol by helicopter. Performances measured included:

a. Ability to properly prepare equipment for loading into a helicopter.
b. Ability to properly board a helicopter.
c. Knowledge of in-flight procedures and behavior.
d. Skill in tactical offloading of helicopter.
e. Ability to select adequate landing zone for patrol extraction.

10. M16A1 Rapid Reaction Range Firing

This test measured the ability of the individual to effectively engage close (35-100 meters) surprise targets while negotiating difficult terrain and natural and man-made obstacles. The testee as a member of two-man team advancing over difficult terrain was required to engage with the M16A1 rifle surprise pop-up targets at ranges similar to those anticipated for SIAF patrol units. Targets remained exposed from three to five seconds and automatically dropped when hit. Firers were allocated three rounds of ammunition per target and were required to change rifle magazines during the exercise.

Specific performances measured included:

Target	Target Distance	Time Target Appears
1 F-silhouette	35m	3 sec
1 F-silhouette	45m	5 sec
2 F-silhouettes	50m	5 sec
1 F-silhouette	75m	5 sec
3 F-silhouettes	100m	5 sec

11. M16A1 Rifle Immediate Action Drill

The rifle is the primary source of firepower immediately available to a SIAF patrolee. In the event a rifle misfires or fails to fire, the SIAF member must have the requisite knowledges and skills to rapidly apply immediate action, diagnose the causes for the stoppages, and apply proper remedial action to return the rifle to operating condition. Specific performances measured by this test included:

a. Application of immediate action to an M16A1 rifle that fails to fire even though a round has been chambered and the trigger releases the hammer.
b. Determination of the causes for failure to fire.
c. Application of proper remedial action to place the rifle back in operating condition.

12. M79, 40mm Grenade Launcher Field Target Firing

This test measured the ability of individual testees to effectively engage point and area targets with the M79, 40mm grenade launcher. Targets selected were representative of those most likely to be engaged by SIAF grenadiers. A time length of two minutes was imposed for the complete firing exercise. Two rounds of ammunition were allocated per target; firers were encouraged to achieve first-round hits, which scored five points as opposed to three for second-round hits. Use of correct positions was emphasized and points were awarded for use of proper positions. Specific performances measured included:

a. Ability to hit a bunker opening at 105-110 meters using the kneeling supported position.
b. Ability to effectively engage five E-type silhouettes (represented troops in open) at 200 meters while firing from a foxhole.

13. M79, 40mm Grenade Launcher Remedial Action

This test determined the ability of individual testees to apply immediate action to an M79 grenade launcher that failed to fire, determine the cause for the failure, and apply remedial action to return the launcher to firing condition. Performances measured included:

a. Ability to apply proper immediate action procedures, to include adherence to safety requirements associated with a misfire of an M79 grenade launcher.
b. Ability to determine reasons for misfire by checking most common causes.
c. Ability to correct the causes for misfire by applying proper remedial action.

14. M60, 7.62mm Machinegun Firing

This test measured the ability of testees to engage stationary targets at ranges varying from 400 to 800 meters. Performances measured included:

a. Ability to correctly load and place the M60 machinegun into action.
b. Ability to effectively engage sets of double silhouette targets placed at ranges varying from 400 to 800 meters.

(Eight target sets were used with target number 1 located at 400 meters, and target number 8 at 800 meters. The remainder were placed at varying ranges between targets number 1 and 8. Targets were situated so that they appeared to the gunner to be a minimum of five mills apart in width or 150 meters apart in depth. Targets were so located that firers were required to make either a major elevation or direction change when engaging any two successive targets. Testees were allotted 180 rounds of ammunition.)

15. M60, 7.62mm Machinegun Remedial Action

This test area determined the testee's ability to accurately and rapidly apply immediate action to an M60 machinegun and reduce a stoppage. The testee was given a situation where he was a machinegunner with a SIAF patrol and the machinegun failed to fire because of a malfunction. He was told to correct the situation. Performances measured included:

a. Ability to apply proper immediate action procedures to a machinegun:
    (1) That is not hot enough to cause a cookoff of a chambered round.
    (2) That has just fired two bandoleers within two minutes.
b. Ability to diagnose the causes for the failure to fire.
c. Ability to apply remedial action and return the machinegun to operating condition.

16. Map Reading and Land Navigation

The purpose of this test was to determine the testee's ability to perform map reading and land navigation functions. The test required the testee to locate himself on the ground and on the map; navigate multi-routes with magnetic azimuths; locate points on the ground and on the map, and measure distances on the ground and on the map. Performances measured included:

a. Ability to read a topographic map.
b. Ability to use a magnetic compass with a topographic map.
c. Ability to measure distances on the ground and on the map.
d. Ability to navigate a specified land navigation course within three hours.

17. SIAF Knowledges and Skills Test

This test is a 170-item information test that samples the following content areas:

a. Use of weapons.
b. Identification and detection of enemy boobytraps and warning devices.
c. Procedures for calling indirect and aerial fire support.
d. Use of the field radio and communications procedures.
e. Intelligence procedures.
f. Patrolling.
g. Battlefield movement.
h. Detection of enemy soldiers by auditory cues.
i. Escape and evasion procedures.
j. Tracking procedures.

k. Helicopter insertion and extraction procedures.
l. Land navigation procedures.
m. Use of image intensification devices and sensors.

18. SIAF Confidence Inventory

The inventory consists of 22 items designed to measure an individual's confidence in his ability to perform in combat situations. Each item describes a combat performance situation. The respondent must read each situation description and then, using a set of 13 word-pairs, describe his ability to perform the task specified by the situation. Each word-pair represents opposing poles of a continuum of confidence which is divided, for rating purposes, into seven differentially weighted intervals. For each word-pair for a given performance situation, the respondent chooses and circles the interval that reflects his opinion of his ability to perform the task specified. The 13 ratings are then summed, providing the respondent's situational confidence score for that performance situation. Finally, the scores for all 22 performance situations are summed and divided by 22 to obtain the respondent's mean confidence score for the SIAF Confidence Inventory.

19. SIAF Self and Peer Performance Ratings

These are ratings made by each individual on a seven-point scale of effectiveness. After the SIAF Performance Test was completed, each respondent rated the effectiveness of his performance during the test. In addition, he rated the effectiveness of each other member of his testing group. The individual's rating of his own performance during the testing provides the self-performance score, and the mean rating of each member by his fellow group members provides the peer rating score.

Appendix B

INTERCORRELATION MATRIX FOR THE PREDICTION TEST SCORES INCLUDED IN THE FINAL SIAF BATTERY AND THE WEIGHTED CRITERION SCORE FOR THE VALIDATION GROUP

(N=100)

Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Auditory Number Span	–	–.14	–.19	–.04	.19	–.01	–.23	.04	–.29	–.10	–.12	–.17	–.07	–.07
2 Embedded Figures		–	.52	.45	.13	.08	.28	–.10	.01	.51	.36	.38	.11	.41
3 Verbal Classification			–	.37	.14	.16	.29	–.15	.05	.49	.41	.45	–.04	.39
4 Word Grouping				–	.26	.09	.20	–.14	.09	.46	.30	.37	–.13	.38
5 Word Number					–	.08	–.05	–.17	–.04	.13	.06	–.01	–.27	–.04
6 Life History Inventory						–	.38	.13	–.07	.23	.11	.34	–.17	.23
7 Military Interest Blank							–	–.04	.36	.32	.34	.33	.04	.45
8 Background Despair Score								–	–.13	–.13	–.02	–.02	–.10	–.13
9 Team Task Motivation									–	.13	.12	.13	–.01	.38
10 ACB Arithmetic										–	.42	.58	–.10	.43
11 ACB Army Clerical											–	.31	–.10	.41
12 ACB Automotive Information												–	.03	.25
13 Physical Endurance													–	–.18
14 Weighted Criterion Score														–

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